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Assembling, Testing and Storing Motors

Using Small Trucks or Casters, Elevated Tracks, Roll-over Frames, Transfer Tables, Overhead Carriers and Elevators for Storing in Tiers

By FRED H. COLVIN
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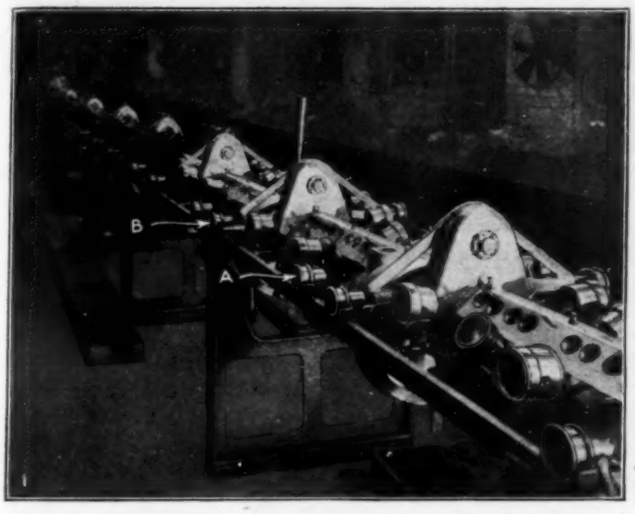


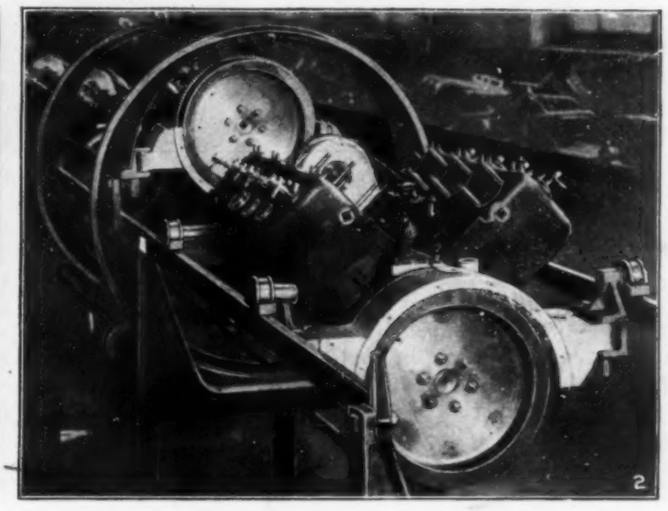
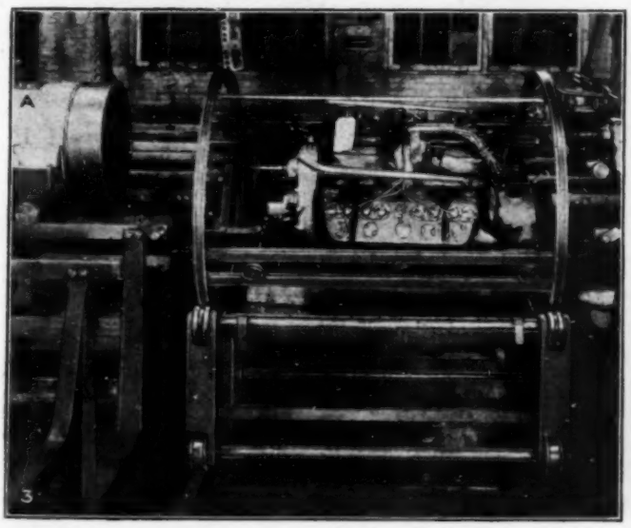


FIG. 1—ASSEMBLING TRACK FOR MOTORS. FIG. 2—ROLL-OVER FRAME AND TRANSFER TABLE

THE way in which the Peerless Motor Car Co. handles its motors, both in assembling, in testing and in storing for future demand, presents a number of problems and their solution. The various methods used are well worth studying from a number of different angles, as parts if not all of the system can be used in many places.

In Fig. 1 is shown a portion of the line of elevated track on which the motors are, for the most part, assembled. It will be noted that each crankcase has four small caster or truck wheels. Two wheels as at *A* are bolted to the case, utilizing the same bolt holes as for fastening the motor to the frame. The other two wheels, as at *B*, are mounted on a frame which bolts to the front of the case. When the front cover is put on, the frame carrying the wheels at *B* is removed and wheels, as at *A*, are bolted to the case. The track holds the motor at a convenient working height and permits it to be easily moved down the line as the assembling progresses. As shown, the crankshaft and connecting



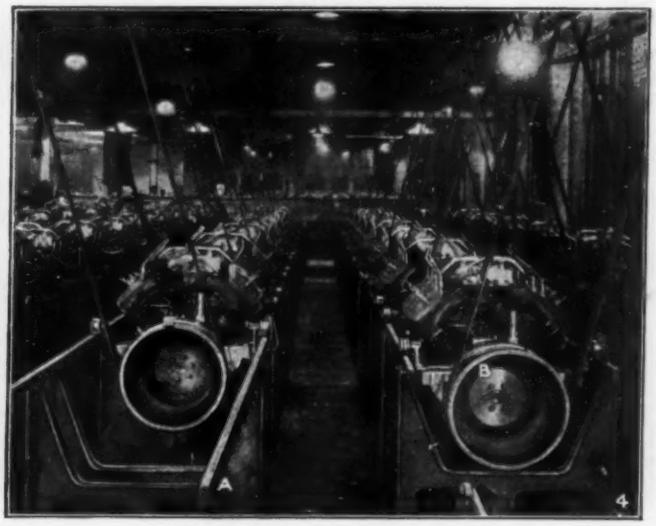


FIG. 3—TRANSFER BETWEEN TWO LINES OF TRACKS. FIG. 4—PART OF THE RUNNING-IN STANDS

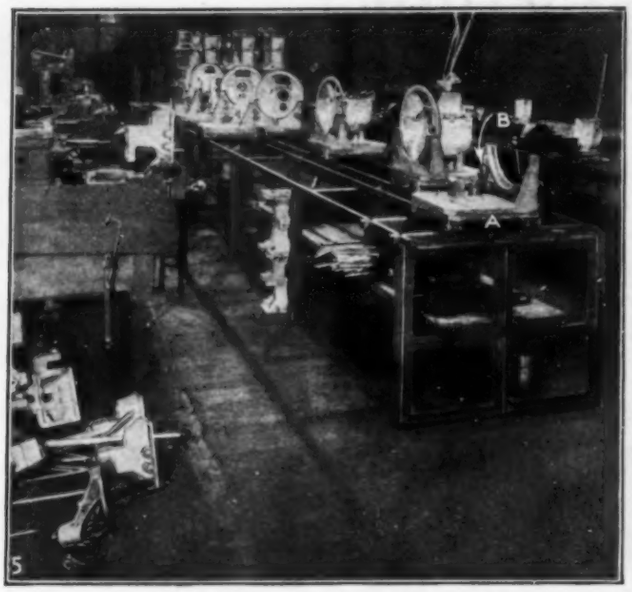


FIG. 5—THE TRANSMISSION ASSEMBLY. FIG. 6—BRINGING THE TRANSMISSION TO THE MOTORS

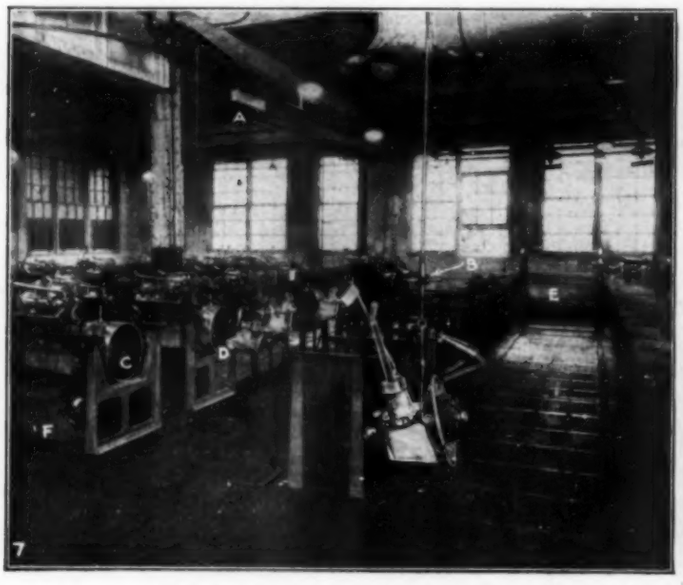
rods are in place and the case is ready for the cylinders, manifolds, and other parts.

A motor, practically completed, is shown in Fig. 2, and immediately ahead of it is a roll-over frame for turning the motor upside down or putting on the lower crankcase as well as inspection or adjustments. This frame is shown in detail in Fig. 3. It will be seen in this illustration that the roll-over frame is mounted on small wheels on a cross track so that it acts as a transfer table by which a motor can be taken from any one of the assembly lines and transferred to any other line on either side of the transfer track. A motor is shown upside down at *A*.

There are also plain transfer trucks, as at *A* Fig. 4, which are used when it is not necessary to turn a motor over. This view also shows part of the running-in stands. The capacity of this department, however, can hardly be judged from the illustration. The motors are run in by belts from the overhead countershafts, each countershaft being supplied with a friction clutch. It will be noted that each motor is provided with a suitable pan, drawn deep in the center, for catching any oil drip which may work out of the motor during the running-in process. A special, light pulley is bolted to the flywheel, as shown at *B*, and is used for running-in the required 20 hr. at 250 r.p.m. The motor is then torn down and all wearing parts inspected. After reassembly it is run 10 hr. at the same speed as before and then goes to final test under its own power.

Assembling the Transmission

In the meantime, the transmission units are being assembled, a portion of this department being shown in Fig. 5. Special frames are provided as at *A*, mounted on small wheels which fit the tracks at the top of the assembling benches. The clamps, shown at *B*, hold the transmission case in place during assembly. As the transmissions are completed they are suspended from a series of overhead carriers, as shown in Fig. 6. Each of these carriers consists of a bar carrying four flanged wheels and these fit over and run on a T-shaped runway suspended from the roof girder. These wheels come up



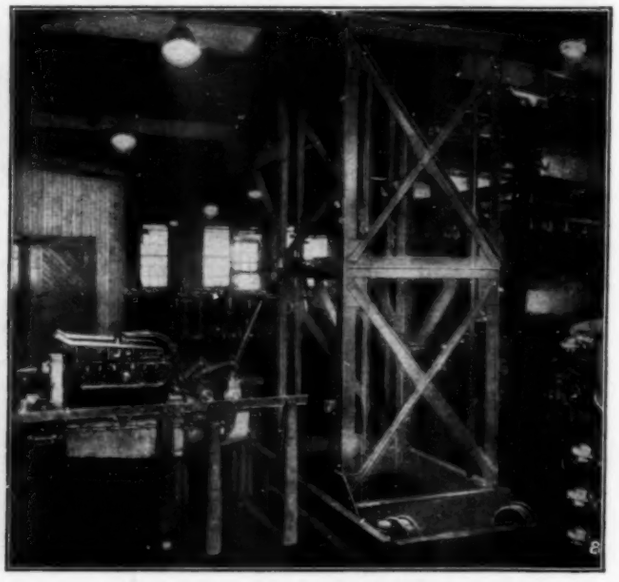


FIG. 7—PUTTING TRANSMISSIONS ON MOTORS. FIG. 8—ELEVATOR FOR TIERING MOTORS

on each side of the rail and rest on the T-head, being spaced far enough apart to clear the supporting hangers.

Each carrier bar *A* has a long rod through the center, fitted with a four spoked right and left nut which acts as a turnbuckle as at *B*. Below the turnbuckle is a short rod and suitable hooks for lifting the transmission and suspending it during transit from the assembling department. One of these carriers is shown more clearly in Fig. 7 where the transmission has reached the motor for assembly, after the running-in has been completed. This view shows both the carrier *A* and turnbuckle *B* quite plainly and gives a better appreciation of the convenience of the arrangement. The turnbuckle facilitates raising the transmission to line up with the motor. At *C* is a motor which still has the running-in pulley in place, at *D* the transmisson is swung into place for final assembly. Here we see the assembly tracks, showing where the transmissions come into the progressive assembly, and the roll-over frame at *E*. At *F* is a battery and ammeter for testing starting motors.

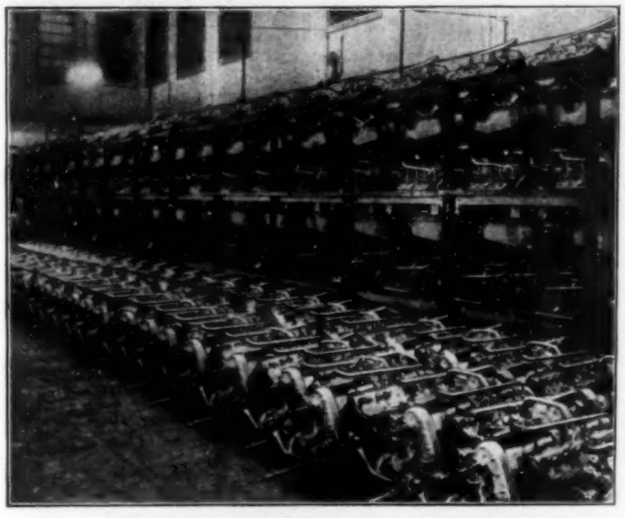


FIG. 9—COMPLETED MOTOR STORAGE

It runs on a small track to reach every line of the assembly tracks.

Storing Completed Motors

Motors are usually made up in advance of assembly into the chassis and it is necessary to store them safely and compactly. For this purpose, a sort of elevator known as a tiering machine is used and is shown in Fig. 8. This is a self-contained elevator built with a steel frame and mounted on fair-sized, flanged wheels which fit on a track running crosswise of the storage tracks. In other words, it is a combined elevator and transfer table. The elevator car is merely a pair of rails which correspond to the assembling tracks already shown, and the completed motor can be run on the elevator, hoisted to the desired level, the whole elevator moved sideways if necessary, and the motor run to any storage track desired.

The motor storage racks, which consist of three tiers of tracks, are shown in Fig. 9. This view also shows the racks full and a fair sized surplus on the floor beside them. This condition, however, is not general, the racks being built to accommodate the usual number of motors stored. These racks keep the motors safely and out of the way but readily available for assembly whenever needed. With minor modifications, such a system can be adapted to many other kinds of manufacturing.

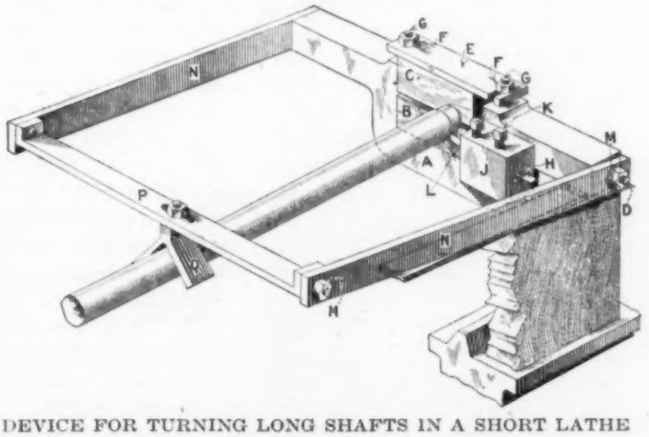
Turning Long Shafts in a Short Lathe

By Edward Heller

Mr. E. W. Tate's article, Re-Echoes from the Oil Country, in the *American Machinist*, Vol. 56, No. 26, reminds me of a method we used for turning long shafts in a famous textile town in Russia. While Mr. Tate's description is of a stunt used in an exceptional case, the method and tools that will be described here are of a kind that were used every day as a regular feature.

The shop where this method was employed had a gap lathe that swung about 14 in. over the carriage and about 3 ft. in the gap but would take only about 6 ft. between centers and that, of course, would not do for 20 ft. or longer shafts. Now, at that time and in that part of the world, we did not know anything about cold rolled shafting as it is manufactured now in all sizes coming within a few thousandths on the diameter and running pretty true in general. The material we got there was black hot-rolled stuff, not very close to any standard size, with bends and kinks that took quite a bit of ingenuity to take out. When a shaft like this was to be used for a transmission shaft, it had to be turned the whole length to a size in order to fit pulleys. And here is how it was done on that short lathe.

The lathe had a wooden bed extension that was as long as our shop permitted. This bed was securely bolted to the lathe bed and lined up nicely with the real lathe. When a long shaft had to be turned the tail stock was moved out on the extension as far as necessary and clamped down with a special bolt and strap. The shaft was then centered with a punch, tried on the centers for accuracy, and when everything looked O. K. it was drilled and countersunk with a home-made drill and countersink held in a peculiar sort of breast drill that must have been brought over on the Ark. As soon as the shaft had substantial centers, it was put in the lathe with a dog on one end and was given a general survey to



DEVICE FOR TURNING LONG SHAFTS IN A SHORT LATHE

see how many "cranks" and kinks it possessed. All the big kinks were then hammered out with a sledge on an anvil that was brought to the lathe, while the minor bends were sprung out straight with a bar, right in the centers.

When the shaft was straight enough to clean up with the cut, it was blocked up in the middle to take the sag out, the dog was fastened as close as possible to the driving end and a piece four or five inches long was turned to size with a tool that left *good sharp tool marks*.

The shaft was now turned, end for end, so that the finished piece was at the tail stock and the device shown in the accompanying illustration was used to turn the rest of the shaft.

This turning device consisted of a cast iron saddle *A*, with studs *D* and *G* screwed in at the places shown and carrying hardwood blocks *B* and *C*. These blocks had a hole bored out to suit the finished size of the shaft and it was so located as to leave not more than one quarter of an inch wall on the front side of the blocks. In other words, the hole was off center in all cases excepting when a shaft of the full capacity of the fixture was turned. The lower block *B* was lined with tin for reasons that will be explained later. On one side of the saddle *A* was a box affair *J* which was provided with stout set screws *K* and *H*, the former for holding the tool *L* down in place and the latter for holding it in and adjusting the cut.

The saddle *A* holding the lower block *B* was placed under the shaft, the upper block *C* was then put in and the whole thing clamped by means of the nuts *F* clamping down the latch bar *E*. The links *N*, *N*, carrying the cross bar *P* and the V-block *Q* were then added, the front end of the saddle *A* was blocked up to prevent it from turning and the lathe was started. As soon as the lathe was in motion the nuts *F* were pulled up snugly so that the shaft could just go around without undue friction and the tool *L* was brought to the work and made fast. The wooden blocks would immediately wear themselves into the tool marks made on the finished piece on the shaft and begin to feed the whole business toward the head stock. The cutting point on tool *L* would usually be an exact duplicate of the tool used in the tool post in the carriage, so that there would be no perceptible stop between the two finishes and it would provide its own means of feeding as it went along.

Making the Job Run Itself

After the outfit moved over its own length the nuts *M*, *M*, *M*, *M*, were released and the links *N*, *N*, and cross bar *P* with V-block *Q* would be thrown over to the back. Then the V-block running over the finished shaft would take off some of the strain from the comparatively short blocks *B* and *C*, and the job went merrily along until the tool box *J* reached the dog at the head end of the lathe. While this turning operation did not complete the job it certainly did most of the work and with very little attention.

A can full of oil with a dripping arrangement was kept over the tool point and the excess oil went to the wooden feed bearing. One of the apprentice boys (and the writer was one of them) was generally delegated to keep the can full, and occasionally tighten the nuts *F* to take up the wear on the upper block *C*. The lower one being lined with tin would usually last throughout the whole trip. The reason for the tin lining was to preserve as much as possible the setting, since the cutting tool *L* was practically integral with the lower block while it did not matter how much the upper block wore out.

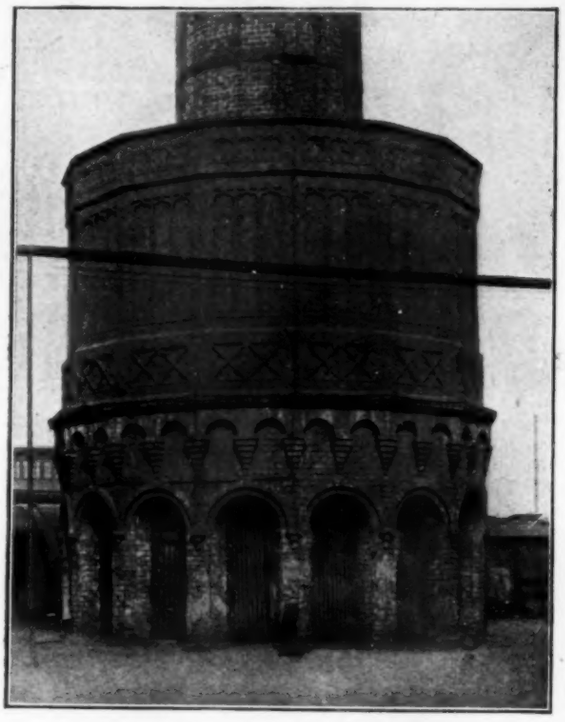
Keeping the wooden block at the right pressure was comparatively easy. All that was necessary to do was to watch the "motor." In our case it consisted of a human being turning a crank somewhere in a corner of the shop from which emerged a belt to an overhead shaft carrying the cone pulley for our lathe. As it was the duty of the apprentice boy to help the "motor" along occasionally he could feel very quickly when the feed mechanism was getting loose, while, on the other hand, a grunt issuing from the power plant would be evidence that the wrench was pulled a little too far.

To finish the shaft the carriage was dismantled, the apron and gibs taken off and what was left was put on the wooden bed close to the tail stock and fastened down with special clamps. The work was then finished by using the compound rest. After the ends were turned and fitted to couplings, the shaft while running at high speed (i.e. at as high a speed as could be drawn out from our "motor") was first filed to size to a ring, then the couplings were driven on, keyed and faced in the centers on the shaft. When all this was done the shaft was polished with oil and emery and was ready to be "hung."

A Peculiar Water Tank

By A. B. Seaman

The water tank shown supported on brick work and surrounding the chimney base in the accompanying illustration is built of cast-iron segments bolted together. The tank was built in 1853 and has never been known to leak. The original purpose of the tank was to supply water to the Savannah shops of the Central of Georgia Railway. The brickwork supporting



TANK SURROUNDING A CHIMNEY

the tank originally inclosed the shop toilets, but the space under the tank is now used for storage.

The chimney, built at the same time as the tank, is about 150 ft. high, and is lined with fire brick the entire height. The foundation of brick and mortar is laid to a depth of 15 ft. below the ground level. The chimney is bell-mouthed at the top and the thickness of the brickwork at that point is almost 6 feet.

The chimney has been struck by lightning many times without further damage than having a few bricks knocked off. Owing to its age and possible deterioration it was banded at intervals of about 15 ft. ten years ago. One of the lower bands can be seen just above the top of the tank.

Making Steel Balls

Conclusion of Article on Atlas Ball Company Methods—Methods of Hardening Large and Small Balls—Lapping, Finish Grinding and Polishing

By A. L. De LEEUW
Consulting Editor, *American Machinist*

AFTER soft grinding the balls are hardened. This is done in an automatic furnace which is shown in Fig. 10. A few shovelfuls of balls are thrown in the front end of the furnace which, as will be noticed, rotates around its axis. The interior of this furnace is provided with a helical pathway which extends the entire length with the exception of the front end where the loading is done. A scoop or projection of the rotating

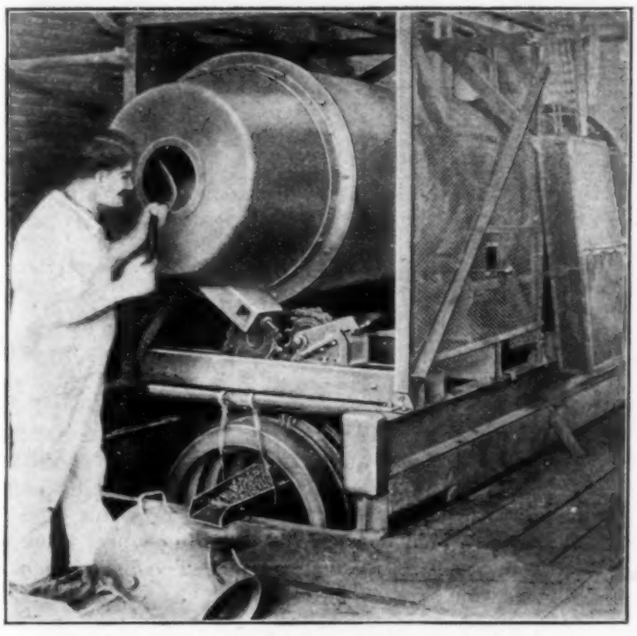


FIG. 10—ROTATING HARDENING FURNACE, AND ROTATING QUENCHING DRUM

compartment gathers up a few of the balls and when the rotation of the machine has brought the scoop to the proper position it discharges these balls into the helical groove which they must follow from then on.

The furnace is centrally heated at the far end and the speed is so arranged that the balls are brought to the proper hardening temperature when they have reached that end. They are then automatically discharged through a pipe into the center of another barrel shaped piece of apparatus which may be seen in the illustration, half-way projecting above the floor. The lower barrel is submerged in a large body of water which is constantly renewed by a pump so that its temperature remains practically constant throughout the day. It also has a helical pathway which brings the balls back to the loading side.

The illustration shows clearly how the balls are discharged into a tray, where they are prevented from rolling out by a block of wood. The operator picks one of these balls up every so often and cracks it to observe the fracture. A secondary operation which may be considered properly to belong to the hardening is the tempering. Balls are tempered at a very low temperature, never exceeding 300 degrees F. The smaller balls are tempered in hot water, the larger ones in hot oil. This system of hardening produces very uniform results.

The very largest balls, however, are hardened in a furnace with proper temperature control. The main things to observe with the system of hardening in the rotary furnace are the time and temperature, and both these items are of equal importance. Time is regulated by varying the speed of the driving motors while temperature is controlled by the Leeds & Northrup system. The very small balls are hardened in the little furnace shown in Fig. 11. This furnace also rotates but it is heated from the outside, in other words, the rotating barrel is surrounded by the furnace. The balls are discharged through a pipe into the same cooling barrel which receives the balls from the larger furnace.

The second rough grinding of the larger balls does not differ in any respect from the first. The oil lapping process, however, which follows is of an entirely different nature and presents many points of interest. Fig. 12 shows the machine used for this purpose. In this machine also there are two spindles which, however, in this case are in line with each other. Each spindle carries a metal plate with a number of concentric grooves. The grooves are made V-shaped and the balls rest between them, as shown in Fig. 13, where each of the grooves envelopes the ball for about ¼ of its diameter or perhaps somewhat less. Very shortly after a new plate has been put in service, the abrasive action of the ball changes the contour of the groove so that it will actually fit the ball. It will be noticed that there is a relief at the bottom of the V-groove which is made this way because it has been found that no satisfactory results can be obtained when the balls bear at the bottom of the groove. The grinding in this case is done by means of oil and an abrasive which constantly floods the plates. From a description of the grooves one can readily see that the ball can only travel in a circle and not in a radial direction as was the case with the rough grinding. In other words, it travels around one axis only, a motion which would cause the balls to assume an entirely different shape from what is desired. Right here we find how the proper method can overcome difficulties which could not be met by mere skill.

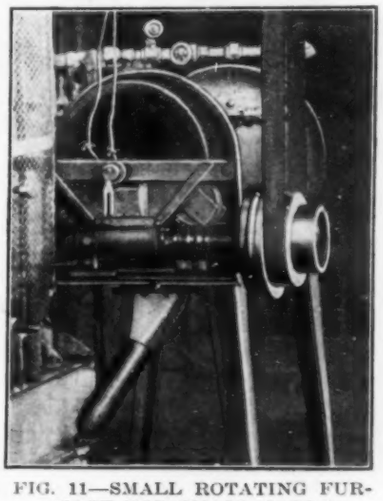


FIG. 11—SMALL ROTATING FURNACE FOR SMALL BALLS

Somewhere in the upper plate there is a large open-

ing in which fits a device which catches the balls and compels them to follow grooves made in that device. There are really two sets of grooves, one set coming from the outside of the plates, the other coming from the inside. The balls are compelled to follow the grooves which are so constructed that those which catch the outside balls deliver them back to the inside grooves and vice versa.

As the balls have been traveling around a certain axis

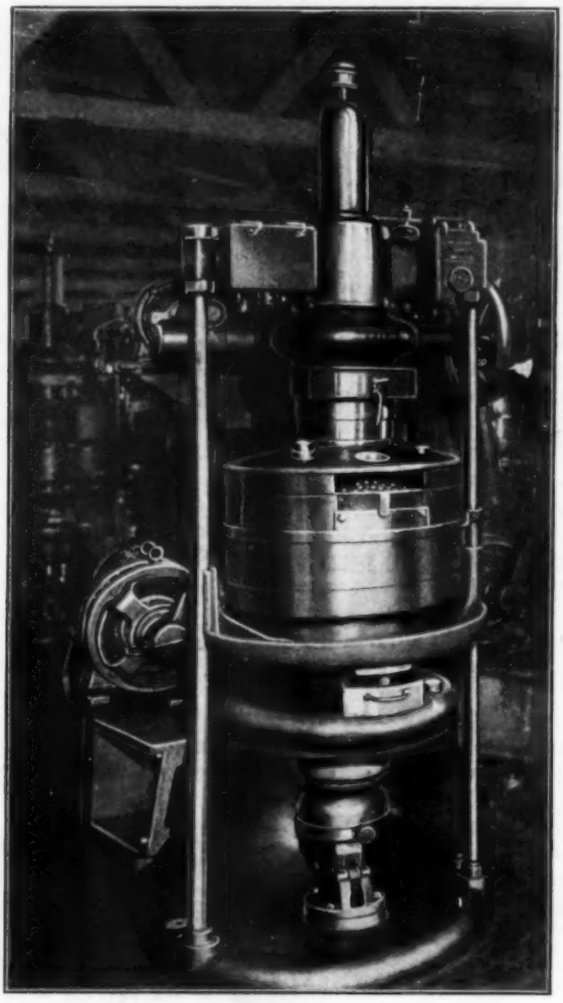


FIG. 12—OIL LAPPING MACHINE

while they were being ground it is almost absolutely sure that when they are delivered again to the plate they will not be in exactly the same position in which they were when they started, so that on their second trip they will be rotated around some other axis and every time they are returned to the plate a new axis of rotation is provided. The balls are in the machine about 40 minutes and the time required to make one complete revolution with the plate is only one or two seconds so that they are picked up and placed again on the plate several thousand times. As a result every part of every ball receives the same treatment.

It might be asked why the balls which come from the outside should be delivered to the inside and vice versa. A moment's thought will show that if this were not done the balls on the outside of the plate would receive a greater amount of grinding than those on the inside because they travel around a larger circle. The redistribution of the balls insures uniform grinding.

The principle embodied in this operation becomes clear when we consider that when there is a snow storm without wind, the snow will fall evenly over a large area notwithstanding that there is never a time when every square inch receives the same number of snow flakes. It is a fact that every operation does very little but the operations are repeated so many times without being controlled in any way that there is a 100 per cent chance that every point of every ball will receive the same treatment.

It was said that the balls after rough grinding presented the appearance of a great number of facets, each one with parallel scratches. As they come from the oil grinding machine the appearance is entirely different. Viewed under the magnifying glass they show an enormously large number of very fine pits or impressions, indicating that under the pressure of the plates the little grains of abrasive were pressed into the metal so that the balls had to roll over them with the result that a very small amount of metal was removed.

After oil grinding the balls are finish ground in a horizontal machine, shown in Fig. 14. In this machine there is a grinding wheel opposite the plate. The plate is grooved and soon after the wheel is set to work, it also will be grooved by the action of the balls. Here again the balls are caught, as in the oil lapping machine, but now they are not immediately returned to the plate but are brought to a contrivance which is called the magazine and which is located at the rear end of the machine.

The balls enter the magazine at its lower end, are elevated, mixed in a large chamber and then returned to the active part of the machine. This method also produces very fine impressions rather than scratches, but the impressions are so small that they can hardly be seen with a strong magnifying glass. The speed at which the grinding takes place is very low, being only about 300 ft. per minute, while the pressure under which they are held against the grinding wheel is very great, from 5,000 to 7,000 lb. in all. The balls remain in this machine from 8 to 10 hours. The time cannot be determined beforehand and is dependent on the rapidity with which the particular wheel acts on these particular balls. The operator has ample time to remove a ball every so often and test it on a minimeter and return it to the magazine.

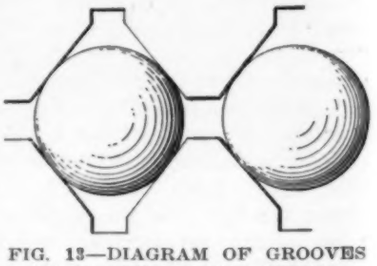


FIG. 13—DIAGRAM OF GROOVES IN PLATES OF OIL LAPPING MACHINE

When the balls are not more than $\frac{1}{10}$ of a thousandth over-size the machine is stopped and the balls removed. About 240 lb. of balls are charged in the machine at one time and it should be noted that this quantity of balls remains intact through the following operations. Not only must the balls be hard and strong but they must be of great uniformity not only of size but also of quality. Such uniformity cannot be obtained without having an almost absolute uniformity of material and methods of hardening, tempering, annealing, etc.

The Atlas Ball Company does not use the same specifications for all of its balls. The analysis of the steel varies with the size of the balls and, as a general rule, it may be said that the carbon contents go down and

the chrome percentage goes up with the increase of size of the balls. Chrome, by the way, is the constituent which permits of even hardening to a great depth. At the same time, no higher percentage of chrome should be permitted than what is absolutely necessary in order not to weaken the other desirable qualities of the ball.

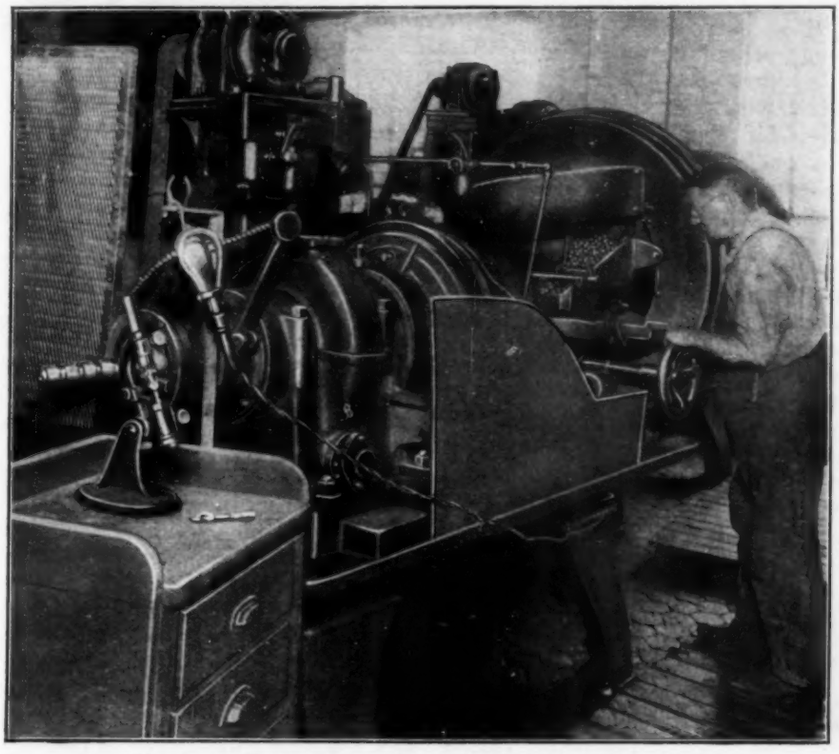


FIG. 14—HOFFMAN MACHINE IN WHICH BALLS ARE GROUND TO WITHIN 0.0002 IN. OF THEIR SIZE

The specifications of the steel range from 1.15 carbon and 0.00 chrome to 0.95 carbon and 1.75 chrome.

It is, of course, of importance to have the correct temperature for hardening but with the instruments obtainable at the present time this is no longer a problem. Of equal importance is the time during which the balls are in the furnace and it was pointed out how this time is regulated for the Atlas balls. For the tempering, low temperatures are used which will relieve the balls of unequal strains caused by the hardening but will not reduce their hardness.

In order to be sure that there shall be uniformity in the steel, the Atlas Ball Company makes it a practice to purchase all the steel of one heat, regardless of whether this amount is too much for their present requirements or not. Even then, the steel is carefully analyzed and followed up through the shop. In no case are two heats mixed in the manufacturing operations so that the mere date of the shipment of a set of balls permits the company to locate the steel from which these balls were made.

Among the shop problems peculiar to the making of Atlas balls and which are not found in most other shops, is the selection of the abrasives for grinding and polishing. Much harder steels are used and much finer grit than in ordinary practice. For instance, for rough grinding Aloxite wheels are used, 40 grit and 848 grade, or Alundum wheels of 60 grit and 848 or 846 grade, while for the Hoffman grinding, which, in a way, is a polishing operation, a flour of extreme fineness is used which is built up into a wheel of extraordinary hardness. It should be remembered that this wheel does not act like an abrasive wheel in ordinary cylindrical grinding machines, that is, the particles of abrasive do not cut as they pass the work and are finally broken out of the matrix, but the protruding fine particles of the abrasive roll over the ball and have a kind of generating action.

Another peculiarity which cannot be lost sight of in the making of balls is the fact that the size of the ball increases during the process of hardening and decreases during tempering. The change is great enough to be taken into consideration as it affects the amount of metal which must be removed by a slow process. A ½-in. ball increases in size practically 0.0015 in. by hardening and decreases again 0.0003 in. when it is tempered at a temperature of 300 deg. The roundness, smoothness and size of the ball can be appreciated by the eye and can be inspected and measured. Defects can be eliminated. There are, however, other qualities of the ball which do not show themselves, which cannot be detected without breaking the product, and yet are of at least as great importance as either of the other qualities.

In order to be of first quality a ball must be extremely hard and strong. Great hardness and strength do not, as a rule, go together. It is customary where these two qualities are required to make the outer surface hard and treat the steel in such a way that the inner metal is tough and will resist heavy strains without breaking. This method of combining strength and hardness cannot be followed with steel balls. A steel ball, in order to be useful for a ball bearing, must deflect or compress exceedingly little under heavy load. If the ball should compress to any appreciable extent its cross-section would become elliptical and it would offer relatively large surface to the ball race. As a result the ball would have

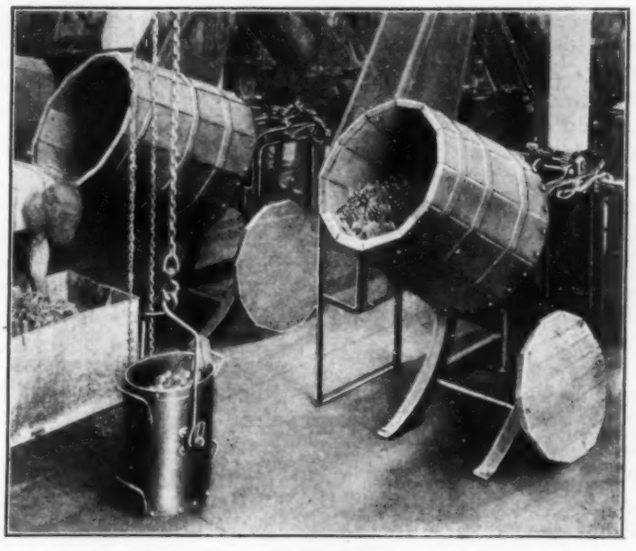


FIG. 15—TUMBLING BARREL USED FOR ROUGH AND FINISH POLISHING

to climb from its minor to its major axis when it revolves in the bearing and appreciable power would be consumed. The proper functioning of a ball bearing is based on the fact that a ball changes its shape very little and in order to be sure that such shall be the case the ball must be of extreme hardness throughout.

The next operation is the polishing which is done in two stages. All polishing is done in inclined barrels such as shown in Fig. 15. The first or rough polishing is done by means of Vienna lime. Four hundred and fifty pounds of balls are loaded in a barrel with the proper amount of lime and are slowly revolved for about 25 hours. This 450 lb. of balls is made up out of two or three sizes, the idea being that the smaller sizes will locate themselves between the larger ones thus causing more points of contact than if there were only one size of balls. The amount of 450 lb. should not be considered as the exact figure. It is made up of two batches of balls, each one coming from a Hoffman machine and, as the theoretical amount of balls given to such a machine is 240 lb., the total amount which is being polished at one time may be as high as 480 lb.

The rough polishing takes practically all of the 0.0002 in. which was left by the Hoffman machine. The final polishing is done by means of scraps of soft leather. The illustration shows this clearly. This last polishing operation removes practically no metal and is more in the nature of a burnishing than a polishing operation. Its duration is about 2 hours.

The subsequent operations of measuring and inspecting have already been described.

The Passing of Craftsmanship —Discussion

BY S. N. BACON

In the article under the above title which appeared on page 648 of *American Machinist*, Entropy expresses regret at the passing of craftsmanship. The writer does not agree that craftsmanship is passing but thinks it is merely shifting from actual skilled work performed upon the product to an even higher grade of work required in making tools of great accuracy that are capable of producing parts in large quantities. Forming and embossing dies for silverware and other ornamental work are good examples. It requires a high grade of craftsmanship to construct such dies properly, perhaps even more so than in the olden days. Then the parts which had been made by hand, although they were beautiful in ornamentation were not all of that same accurate detail which characterizes the present-day manufacturing methods and clever ideas in designing tools.

Another requirement of the present methods for interchangeable manufacture is the extreme accuracy of inspection gages. These gages are often the highest form of the craftman's art although they are not ornamental. It is regrettable that these wonderful tools are never exhibited, but the craftsman must surely derive considerable satisfaction in exhibiting the final product as for instance the metal pencils, mechanically engraved and such wonderful products as the radio, telephone, fire-arms and adding machines. The writer always has a wonderful sense of satisfaction when he sees a certain rifle or typewriter displayed for many of their principal parts are manufactured by the tools he has designed.

Standard Numbers for Steel

At a conference held in Washington, D. C., December 6, 1922, Lawford H. Fry reported a resume of European practice in the numbering of steel, based upon replies to a circular request for information sent by Dr. Agnew to the standardizing bodies of Great Britain, the Netherlands, Germany, France, Austria, Sweden, Belgium and Switzerland. Canada, Norway, Italy, Czecho-Slovakia and Japan made no reply.

Great Britain has done practically nothing since its adoption during the war, of the symbols of the Air Ministry. There is, however, a strong desire to adopt some other form of symbol for automobile steel. No system has been adopted in the Netherlands, although the Royal Institution of Engineers has standard specifications which were issued March 4, 1911. In these, the specified grades are designated by arbitrary letters. The Austrian Industrial and Trade Standards Committee has done nothing since the publication of a tabulated nomenclature of iron and steel on September 30, 1921.

Recent Action of Swiss Engine Builders

The Standards Committee of the Swiss Association of Engine Builders has just issued a series of tentative standard sheets covering carbon, nickel chrome and nickel steel. The principle of the system of symbols is to show the content of the carbon and of the principal alloys by using the standard chemical symbol of the element in question, and adding to it a figure showing the mean percentage of this element. Thus, a carbon steel with 0.25 to 0.35 per cent carbon is symbolized as C2n. The C indicates carbon and the amount is given by the figure 2, representing a mean content of 2/10 per cent. The "n" shows a maximum allowable content of 0.07 per cent phosphorus and 0.06 per cent sulphur. If the symbol is C2s, the maximum allowable phosphorus is 0.04 per cent, and the sulphur 0.03 per cent. If the symbol is written C2, then neither phosphorus nor sulphur is permitted to exceed 0.02 per cent.

The German Industrial Standards Committee has issued a tentative standard under date of August 12, 1922, covering steels without alloys, and untreated. This covers seven grades, for which the tensile strength and elongation in the annealed condition are certified. The grades are designated by arbitrary numbers, with the prefix St.

French Standardization Specifications

In France, the Permanent Commission for Standardization is issuing a series of standard French specifications for various materials. Five specifications are given, and the steels meeting these specifications are to be marked to indicate the material as follows: The number of the specification, a letter indicating the method of manufacture, and a number showing the minimum tensile strength specified. The French Commission points out that this system of marking gives a compact symbol which, by referring to a definite specification, leaves no room for misunderstanding. It also takes account of the principles laid down by the Consulting Committee of Manufacturers, which recommended that designations of material should be given in full and not in codes. As shown, the Swiss and the French systems are directly opposed to each other, and Mr. Fry seems to feel that the French plan is to be preferred in every way.

Single Hole Drilling on a Multiple-Spindle Machine

A Three Station Fixture—Work-Holding Jaws Closed by Weights—Carriers Adapted to Various Sizes of Work by Changing Jaws

By W. F. SANDMANN

A FEW years ago the multiple drilling machine was brought into use only when large numbers of parts having ten to twenty or more holes in the same plane were to be drilled. It would have been considered absurd to even entertain the thought of using the multiple-spindle machine for parts having but a single hole to be drilled. Now the field of its usefulness has broadened until there is no such a thing as too few holes in a piece for it to be a multiple drilling proposition, so long as there is to be quantity production.

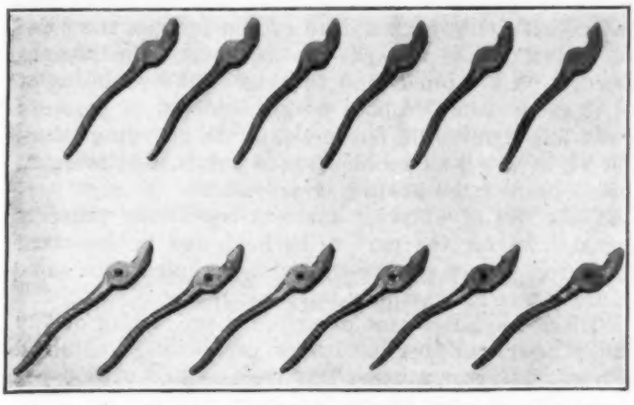


FIG. 1—THE WORK BEFORE AND AFTER DRILLING AND REAMING

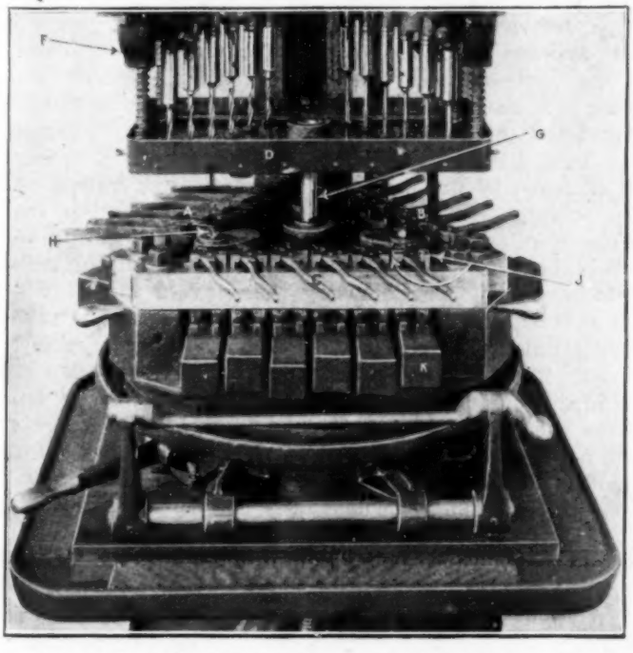


FIG. 2—THE DRILLING MACHINE WITH FIXTURE AND WORK IN PLACE

The success of single hole drilling on the multiple-spindle machine depends almost entirely upon the type of fixture that is used for securing the work while the operation is being performed. An example of an interchangeable fixture and machine set-up for single hole work is that used for the drilling and reaming of drop-forged plier halves. The plier halves are shown in Fig. 1, both before and after drilling and reaming the ⅜-in. hole through the boss. A half dozen or more different sizes of these pliers are manufactured so the fixture had to be arranged to accommodate them all with the minimum of time for changing from one size to another.

A Natco Type 80, automatic cam-feed multiple-spindle drilling machine is shown in Fig. 2, with a three-station plier fixture in place on a rotating table approximately 2 ft. in diameter. At *A* six plier halves are shown in the drilling position, at *B* six more are in the reaming position after having been drilled at *A*, and out in front and from under the head of the machine at *C* are six plier halves drilled and reamed and ready to be removed from the fixture. The drills and reamers can be seen in their respective spindles and the construction of the machine allows each of these spindles to revolve at the proper speed for the tool it contains, making possible the simultaneous drilling and reaming operations.

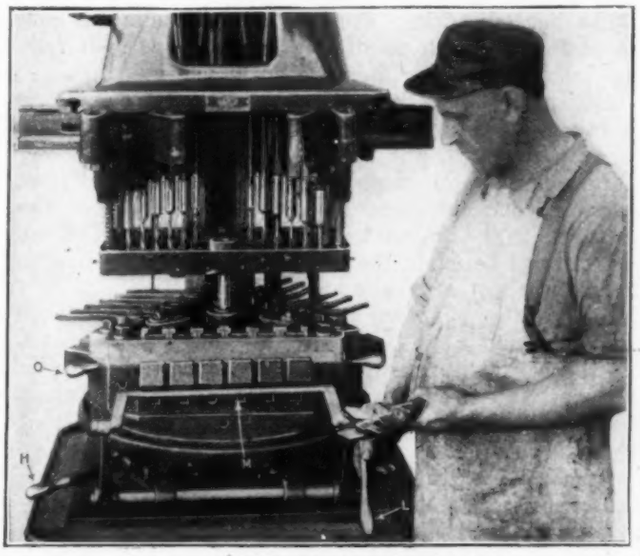


FIG. 3—REMOVING FINISHED WORK

The guide bushings for the drills and reamers are carried in the plate *D*, suspended from the head of the machine by four spring suspension arms *F*. The guide bushings are slip bushings within a liner bushing so that they can be easily changed to suit the size hole to be drilled or reamed. Around the edge of the suspension plate is a band of sheet metal forming a reservoir into which the cooling compound is pumped.

As the only outlet for the compound is through the bushings, the proper cooling of the tools is assured at all times.

When the head of the machine is fed down to begin the operation, the suspension plate *D* locates in the proper position on the fixture by means of the center-post *G* and whichever one of the three short dowels *H* that happens to be at the rear of the machine. The

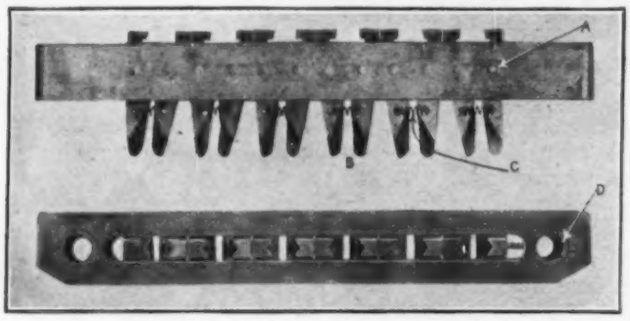


FIG. 4—ONE OF THE CARRIERS

plate comes to rest on pads when it is ¼ in. above the work and the drills and reamers pass on into the work. The suspension springs are compressed tending to hold the plate tightly in position and the suspension rods pass into the opening in the head of the machine.

Each plier half is held between a pair of equalizing V-jaws *J* which are spread apart at the bottom and forced together at the top on the plier by the action of the weight *K*. It is necessary that each pair of jaws be an independent clamping device on account of the variations in the diameters and thicknesses of the pliers, the forgings being in the rough at this operation with the exception of a ground side.

The operator is shown unloading a half dozen finished plier halves in Fig. 3. He presses down on handle *L* and the bar *M* is thrown up, lifting all six weights at the same time and allowing the jaws to spread open at the top. The six finished plier halves are removed from the fixture by a sweep of the hand and six unfinished halves placed in the jaws. The handle *L* is lifted, allowing the weights to fall back into place and the loading is completed. The unloading and reloading operations are performed while the machine is in operation, the only idle time being when an operation is completed and while the operator is pushing down lever *H* releasing the indexing bolt and swinging the fixture a third of a revolution by means of one of the handles *O*. This places the plier halves that have just been loaded at *C*, Fig. 2, in drilling position *A*, those that have been drilled at *A* in reaming position *B* and those that have been reamed in position *B* come around to *C* completely drilled and reamed. The operations of the cycle are then repeated.

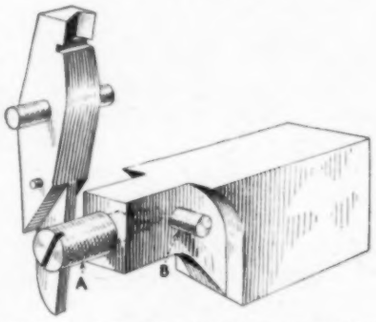


FIG. 5—DETAILS OF JAW CLOSING DEVICE

Two views of the carrier, or jaw holder, containing six pairs of clamping jaws are shown in Fig. 4. The fulcrum pins of the jaws are at *A* and the weight closes the jaws by spreading their lower ends at *B*. The spring *C* pulls the jaws together at the bottom when the weighted spreader is removed, causing them to open at the top and release the work.

The carriers are made sufficiently wide to support the plier halves before the jaws are tightened. The holes in the ends are bushed as at *D* and fit over studs in the fixture where they are held down by nuts. This construction permits a carrier to be removed and replaced by another, containing jaws for different work by merely taking off two nuts and washers. Several sets of carriers are provided.

Details of the jaw closing device are shown in Fig. 5. The screw *A* does the actual closing of the jaws and is removable so that different diameters of screws can be inserted for different spreads of jaws that may be required. It should be noted that the screw *A* comes into contact with only a thin edge of the jaw, as the sides are milled away toward the bottom. The weight fulcrums on the pin *B* and because of the positions of the fulcrum points in both weight and jaw, a pressure of not less than 70 lb. is exerted at the clamping point. The Vs in the jaws recede toward the bottom to cause a more pronounced holding down effect.

By the use of different carriers containing properly shaped jaws for the part to be held, and by inserting the correct size of pin for the spread required, the same fixture can be made widely interchangeable.

With the arrangement described a production of 720 drilled and reamed plier halves per hour is obtained with one operator against less than a total of 500 per hour by three operators using gang drills.

Effect of a Private Sidetrack on Insurance

An industry in the Middle West raises the question as to the possibility of obtaining insurance against liability for damage caused by a railroad while operating over a private sidetrack.

It appears that the industry, according to the terms of its contract with the railroad, has agreed to assume two distinct liabilities. In the first place, it has contracted to indemnify the railroad company against any legal liability arising in the event that property be damaged by fire caused by locomotives operating on the private sidetrack. This provision applies to the property of the industry or other property on its premises, except that belonging to or in charge of the railroad company. The industry thus agrees that it will not make claim or permit to be made against the railroad company in the event of damage to its property. In case fire insurance is carried, this agreement can be fulfilled by requesting the insurance company to endorse the policy to the effect that subrogation rights will not be exercised. An additional premium is usually charged for this endorsement. If there is other property on the premises which does not belong to the industry, the industry should be sure that it is covered by a fire insurance policy containing a waiver by the insurer of subrogation rights.

In the second place, the industry has agreed to indemnify the railroad company against liability for loss, damage or injury to persons or property while on or about said sidetracks, occasioned by any act or omission of the industry, its employees or agents. As it is customary for casualty companies to assume this contractual liability as a supplement to policies of workmen's compensation and public liability, insurance protection can thus be obtained.

Industrial Cost Accounting for Executives

Fifth Part — Business Functions and Their Organization—Classification of Departments and Designation by Mnemonic Symbols — Typical Organization Chart

By PAUL M. ATKINS

IN THE PREVIOUS articles we have surveyed very briefly the various elements of costs and the accounts and journals by means of which cost elements are recorded. It is now time to turn aside from what may seem to be the direct path of our discussion and spend a little time considering a subject, which, at first glance, may appear to have very little direct connection with our main topic. The subject, as was mentioned in the first article, is the functionalization and organization of a business. It is fundamental to the study of almost any problem concerning a business, and an understanding of it will be found not only helpful at various times in the consideration of our subject, but practically indispensable if the real significance of the method of expense classification which is described later is to be grasped.

Definition of "Functionalization" and "Organization"

Functionalization and organization may, perhaps, seem like long words with rather shadowy meaning. The first often seems to have an academic flavor and the latter is used to mean so many different things that it has lost much of its significance to most business men. They serve to describe certain ideas, however, better than any other words, and though these ideas are rather complex and have been made to seem much more difficult of comprehension than they really are, they are very useful to us in our discussion. Before going any further, therefore, let us see if we cannot agree upon definitions for these words which, while not entirely complete and exact will be sufficiently so to serve our purpose here and which can be improved, if necessary, later.

Functionalization, I think we can say, is the analyzing or breaking up of the business into its functions. Functions, in turn, may be defined as activities, and business functions as the various activities involved in the operation of a business. We speak, for example, of the functions of the purchasing department and mean by that all the various activities which are involved in the making of purchases and which are centered in the purchasing department. When we say the time-study function, we mean ordinarily the operations necessary to make a time-study. The functions of the foreman usually carry the idea of the various tasks which the foreman must perform in supervising the operation of his department. Often the expression is used to mean much larger units when marketing or selling functions are spoken of to indicate all the activities involved in selling the goods which have been produced. We see, then, that the word is employed to mean almost any activity which is involved in the operation of a business and this, in general, is the meaning which we shall attach to it in our discussions.

Organization is used to mean so many different things that no attempt will be made to enumerate them here for they are so varied and diverse that the reader would probably be more confused than helped thereby. The meaning which we wish to give to it here is that of the co-ordination and tying together of the various functions in such a way that they will work most effectively together.

Let us now turn our attention once more to the functionalization of a manufacturing business and study the problem a little more intensively. In the first place we can make one generalization which will hold, practically without an exception. A manufacturing concern can have its functions divided into three main groups. There are those activities which are concerned primarily with the production of the finished merchandise and which we can call the manufacturing functions. There are those which are involved principally in the selling or marketing of the completed goods, and which we can name the selling functions. And then there are those activities which are not directly connected with either manufacturing or selling but serve to aid them, or to co-ordinate or supervise them. Such functions as accounting, filing and general administration are examples of this class which we can probably best call the administration functions.

The particular grouping of functions we have given has considerable importance in cost accounting, as was pointed out in the third article, because it serves as a basis for the classification of expenses, a classification which facilitates both the control of the business and the allocation of overhead to the product. It is a grouping also that can be made for practically any industry no matter what kind of merchandise it produces.

Such a sub-division of a company's activities does not give a very satisfactory basis for their administration or operation. Except in the smallest businesses such units would be much too large and so we find that functions which can be carried on satisfactorily together are gathered together into departments. If departmentalization is done properly we will find that all the detailed functions which make up the three large groups are broken up into departments, and it is with these departments that we shall have to deal.

A Typical Small-Sized Company

Perhaps a simple example will help us to understand the problem which has been outlined. Let us take a moderate sized concern turning out a product made principally of steel and let us see what its functions are likely to be. In the first place there would be the functions involved in producing the finished goods, in this case, let us say, a foundry department, a machine shop and an assembling department. Then there are activities which exist almost solely to aid these operating departments such as the power department, the maintenance department, the planning department, the inspection department and the toolroom, and other departments, such as the engineering department and the purchasing department, the larger part,

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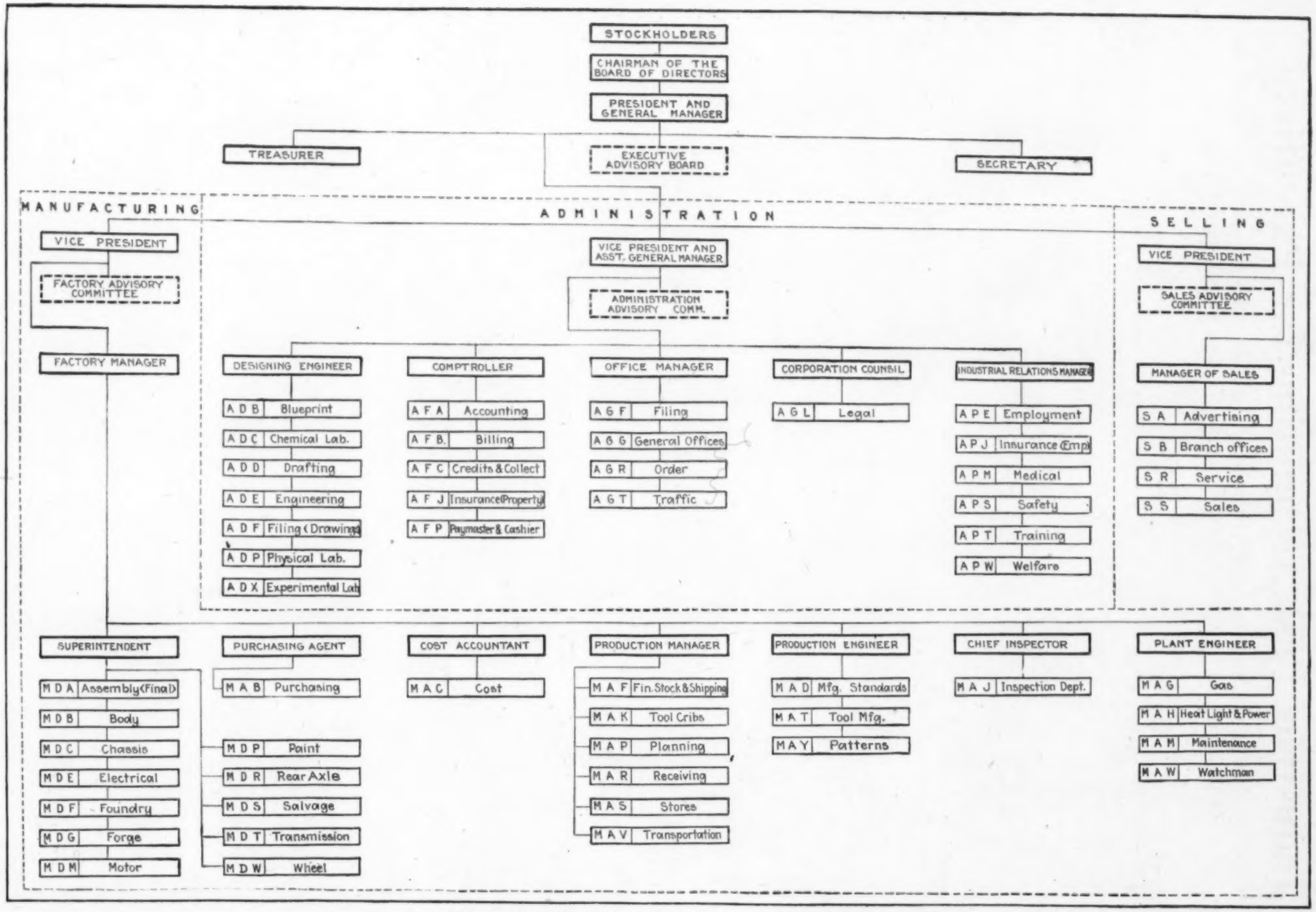


FIG. 3—ORGANIZATION CHART OF A LARGE COMPANY

though not the whole of whose services are to promote the work of the shops.

To handle the selling end of the business, departments like the advertising department and the sales department are necessary, and we can analyze the selling functions into these two groups. The general administration of the business will probably have the record-keeping functions placed by themselves in an accounting department and the writing and filing of letters and general office work can be gathered together into a general office department, while the policy deciding functions can be thus established in an executive department.

So far we have analyzed the functions of the business, but aside from the first division into the three main groups we have not classified them and experience has proved that a heterogenous collection of units is not very useful until it has been classified and symbolized, an act that is different from but closely related to classification. Both terms are subject to long definition, as in the case of functionalization and organization, but we can get along with definitions which are quite simple and at the same time sufficiently exact for our purposes. Classification is essentially the logical, systematic and orderly arrangement of related details, while symbolization is simply the giving of symbols to the details, symbols being nothing more nor less than short convenient names. It is quite possible, of course, to have a classification without having it symbolized and also to have items symbolized without having them classified. To be most satisfactory we must have both together. When we have further classified and symbolized the various departments we obtain something like the following:

THE AMERICAN METAL WORKING COMPANY

A. Administration functions
  AA Accounting department
  AE Executive department
  AB General offices department
M. Manufacturing functions
  MA Auxiliary manufacturing functions
    MAB Buying or purchasing department
    MAE Engineering department
    MAH Heat, light and power department
    MAJ Inspection department
    MAM Maintenance department
    MAN Personnel and employment department
    MAS Stores, stock receiving and shipping department
    MAT Tool manufacturing department
  MD Direct manufacturing functions
    MDA Assembly department
    MDF Foundry department
    MDM Machine shop department

There are probably two features about the above table which will attract the reader's interest first. One of them is the classification of the manufacturing functions into two groups, the first called "auxiliary" indicating that they are an aid to manufacturing though they do not directly have a part in it, and the other "direct" indicating that the departments so classified are the ones in which the actual manufacturing operations are performed. Such a division is most useful when the problem of the distribution to the direct manufacturing departments of the expenses of the other departments is reached.

The second feature is the use of letters, and letters not in their consecutive alphabetical order, to designate the departments. Here we have an illustration of the use of the "mnemonic" system of symbolization, a system which endeavors to aid the memory by employing as far as possible the initial letters of the words which describe the item in hand and its place in the classification, the first letter indicating the principal sub-division, the second the group within that sub-division, etc. Let us take *MDM*, the machine shop department, as an example. The first *M* stands for the manufacturing group of functions, the *D* for the fact that it is the direct manufacturing group, and the second *M* shows that it is the machine shop department within that group. It may be clearly seen here that the position of the letter in the symbol, as well as the letter itself has a significance, a fact that is sometimes overlooked although everyone recognizes that 123 represents an entirely different number from 312.

There is another important advantage, among others, in the mnemonic system of symbolization in addition to the one which has been mentioned above and that is its expandibility. Only 22 letters are used because of the similarity of *Q* to *J* or *I*, of *O* to *Q* or zero, and of *U* to *V*, but even so we have 12 or 13 more than the number of digits available if figures are employed. Hence if only one unit is used in a symbol, 22 of them can be symbolized in a single class if the mnemonic system is used, and only 9 or 10 if numerals are utilized. If a symbol of two units is wanted we have a possible variety of combinations of letters of 484 as against 99 for the numbers, and the difference becomes increasingly marked as the number of units in a symbol is increased.

To offset the advantages there are some disadvantages. It is not so easy to use such symbols with modern tabulating machinery though it is not impossible to do so. Mr. C. M. Ford has described in a very interesting article entitled "Alphabetical and Mnemonic Symbols on Tabulating Machine Cards," in the May, 1921, issue of *Industrial Management* magazine how the problem can be solved. Also, it is not always possible to make the symbols mnemonic, as in the case of the inspection and personnel departments above where *J* and *U* are used instead of *I* and *P*. The *J* is employed because the *I* is never used, and *U* is utilized instead of *P* because the latter is already reserved for another department. In general, however, the advantages outweigh the disadvantages and slowly but surely we are seeing the mnemonic method of symbolization more frequently used.

The case which we have just presented is very simple and there is not likely to be any serious questioning in regard to the details shown therein. Let us, therefore, take up a more complex illustration now, one which is likely to raise a debate concerning some of the details. The following symbolized classification is intended to be typical only. It is the result of extensive study of the problem as it has been worked out for various concerns, especially those engaged in wood and metal working, and may be taken as a general model subject to modification in individual cases.

A TYPICAL SYMBOLIZED CLASSIFICATION OF FUNCTIONS

A. Administration functions
  AD Functions involved in designing and developing the product
    ADB Blueprint and photographic department
    ADC Chemical laboratory department
    ADD Drafting department
    ADE Engineering department
    ADF Filing (blueprint and drawings) department
    ADP Physical laboratory department
    ADX Experimental department

AF Financial functions
- AFA Accounting department
- AFB Billing department
- AFC Credits and collection department
- AFJ Insurance (property) department
- AFP Paymaster and cashier department

AG General administration functions
- AGE Executive department
- AGF Filing (general) department
- AGB General office department
- AGL Legal department
- AGR Order department
- AGT Traffic department

AP Personnel functions
- APE Employment department
- APJ Insurance (employee) department
- APM Medical department
- APS Safety department
- APT Training department
- APW Welfare department

M. Manufacturing functions

MA Auxiliary manufacturing functions
- MAB Buying or purchasing department
- MAC Cost department
- MAD Manufacturing standards department
- MAF Finished stock and shipping department
- MAH Heat, light and power department
- MAJ Inspection department
- MAK Tool cribs department
- MAM Maintenance department
- MAP Planning department
- MAR Receiving department
- MAS Stores department
- MAT Tool manufacturing department
- MAV Internal transportation department
- MAW Watchman department
- MAY Pattern Department

MD Direct manufacturing departments

These departments are sub-divided usually either according to the kind of product turned out as, for example, engine department, rear axle department and body department of an automobile factory, or according to the kind of work to be performed, such as the lathe department, punch press department and heat-treatment department in a general metal working factory doing work largely or entirely to order.

S. Selling functions
- SA Advertising department
- SB Branch offices department
- SS Sales department

An examination of the above classification will show that there are a number of divergencies in it from what is normally found for manufacturing companies. One of the reasons why these differences have been made so apparent is to call them to the attention of the reader and to get him to think about the causes of them. It not infrequently happens that we become so accustomed to doing a thing in a certain manner or to thinking about it in a particular way that we do not realize that there may be better ideas concerning it, or that some of its phases have been overlooked.

As we look at the classification just given, the first section of it—especially if our interests be in the factory—probably seems misplaced. Such functions as those ordinarily carried on by the engineering department, drafting department and experimental department, are very frequently operated under the direction of the factory manager as activities which are directly, and practically entirely, connected with the fabrication of the finished product. When they are concerned only with preparing information for the benefit of the shops the classification of such departments, as was indicated in the first classification, is very appropriately under the head of the auxiliary manufacturing functions. It must not be overlooked, however, that sometimes the design and development of the product is affected by and, in turn, influences the marketing policies of the company. Our large electric equipment companies furnish one good illustration. The design of automobile bodies also is quite as much a matter of pleasing the public taste as it is of supplying the factory with information as to how they should be built.

While, therefore, on many occasions the engineering and allied activities are properly grouped under the head of manufacturing functions, there are often times when they serve both marketing and manufacturing and aid in developing general business policies so that they are correctly classed as administrative functions. Of course, such a splitting up of activities, as is shown here, into an engineering department, drafting department, blueprint and photographic (or photostat) department and filing department is only necessary or desirable in the case of large concerns.

Hardly anyone will question the propriety of treating the financial functions as a sub-division of the administration functions. The real head of this group of departments is naturally the treasurer but he is not properly located in any of them but in the executive department (discussed later) with the other executive officers. The departmentalization of these functions is such as is likely to be found in a moderately large concern and the titles are so self-explanatory that no additional explanation is needed except, possibly in one case. The property insurance department is not frequently found, but for large concerns whose inventories are constantly and often rapidly changing, such a department, or, at least, the recognition and organization of the insurance function is necessary if the company's property is to be fully protected at the least expense.

General Administration Functions

The general administration functions can have only brief consideration here though they form a very interesting subject of study. They include in the first place the policy forming activities as represented by the executive officers, principal managers and their personal assistants grouped together into an executive department. In addition, there are other departments whose location in this group is due more, perhaps, to the fact that they do not properly belong to any other group than to any common tie among them. The filing department is to care for all material which is to be filed and which is not better located elsewhere. It may often be conveniently joined with the general offices department whose activities include the stenographic work, telephone and messenger service, internal mail service and care of incoming and outgoing mail. The order department takes the orders received from customers and prepares the necessary papers so that the goods may be shipped at once or that the factory may begin its work upon them. It serves as an operating link between the sales and the shipping or planning departments. The traffic department has the task of controlling the movement of goods, both incoming and outgoing, while they are in the hands of a common carrier, and thus serves both the selling and manufacturing sides of the business.

When we come to the personnel functions gathered together under the general head of administration, we take up another topic which is likely to raise some questions in the mind of the reader. Probably most manufacturing concerns which have organized the activities involved in their relations with their em-

ployees, other than those of supervision, have placed them in the group of manufacturing functions. As in the case of the functions involved in the designing and developing of the product, this is undoubtedly correct under many circumstances, as for example, when the factory is located away from the general offices of the company and hence not in immediate contact with the general administration of the concern. Under such conditions it would be quite appropriate to organize employee relations departments as a separate group co-ordinate with the auxiliary functions, or even, in the case of a small concern, as a single department in the auxiliary group.

Personnel and Purchasing Departments

There are other occasions, however, when such an arrangement is not so sound. If we find, for instance, that many of the employees are in the administration and selling departments so that a considerable part of the service rendered by the personnel departments is to those groups, then the logic of the situation points to the inclusion of the personnel departments in the administration section. We have additional reason for reaching such a conclusion in case a large part of the work of these departments consists of what may be loosely termed "welfare work" whose results are expected to benefit the business as a whole rather than simply the manufacturing departments. What is sought here, however, is to call the possibilities to the reader's attention and not to force upon him any particular conclusions.

When we turn to the departments which have been placed in the auxiliary manufacturing group we find that most of them logically and practically belong there without any serious question. One or two may need some brief explanation, however, and the dividing line between several of them needs classifying for some readers, perhaps.

The desirability of so placing the first department of all on the list may, quite possibly, be questioned by some. Since the purchasing or buying department directs the expenditure of such large amounts of the company's funds, it would seem proper to include it as a financial department. More often, however, the prime function of the buying department is to buy material to meet the needs of the factory. The fact that it causes the disbursement of money and purchases materials and services for other than factory departments is of secondary importance, though often a factor not to be overlooked or left out of consideration. Hence, in most cases, the classification given is best for this department.

The second department in the auxiliary manufacturing group, the cost department, may also appear misplaced, and since it is the department of most interest to us here and as the pros and cons concerning it are pretty well balanced, it may be well to consider it rather carefully. At first glance it might seem as though the logical place for it would be in the same group as the accounting department, provided it did not form a part of that department. This feeling would be still further reinforced when one considers that the work of the department is largely for the benefit of the business as a whole. On the other hand, there are important reasons why the cost department should be classed where it is. A large part of the results of its work is, or should be, for the benefit of the factory and for the control of its operation.

The most important reason, however, is a purely practical one. While the connection between the cost department and the accounting department must necessarily be very close if both are to operate successfully, the number of entries which pass from one to the other is usually comparatively small, especially in relation to the number of entries which the cost department receives from the planning department. In most cases it will be found that about ninety per cent of the material which must be handled by the cost department comes from the production control records. In many instances also, these papers and vouchers, must be utilized with a minimum of delay if the work is to be successfully carried on and mistakes rectified before it is too late to do so.

Most of the other departments mentioned here need little discussion. Their general scope is evident from their titles. The manufacturing standards department is probably the least well-known of all of them and a word of explanation may be in order here. It is the department whose prime function is the establishment of the operation standards—the making of time studies, the routing of work through the factory, the preparation of standard practice instructions and instruction cards, the setting of tolerances on materials and specifications for the product at various stages of its fabrication, etc. In the past, its functions have often been treated as a part of the work of the planning department and the relationship is, of course, very close. It is often better, however, to segregate them as has been done here.

When all the various functions of a business have been analyzed and classified, the next step is to prepare an organization manual in which a concise but accurate description of what each department is to do should be given. There is no space here to discuss it, but in the following article its preparation and use will be explained and an illustrative section describing the functions of a typical cost department will be given.

Organizing a Business

There is one other matter, however, which does deserve consideration now. The process of analyzing a business into its various functions and departments is essentially a "breaking up" process. It is quite essential, but there is a final step which is equally important and that is to combine and co-ordinate the departments into what we call an organization in such a way that the business may operate with the least amount of friction and with the greatest efficiency.

In approaching the study of the organization of a business the first point which needs emphasis is the fundamental necessity of organizing on the basis of functions or departments and not on a basis of individuals. Departments should be co-ordinated because their activities have points of contacts and not because their respective heads have mutual sympathies. If the criticism in many books in regard to certain types of organization are read with this thought in mind, it will be found that many of the troubles complained of are due to the attempt to organize a business on the basis of personalities and their characteristics instead of on the basis of functions.

There are various so-called "types of organization" such as line, line and staff, Taylor and committee; and much has been written about the advantages of each. In actual practice it will usually be found best to combine several of them in co-ordinating the various

departments and in analyzing and organizing the work within the departments. In some situations one form will prove superior to the others, but in all cases the utilization of the various activities as the units of organization should be adhered to without exception. In a later article where a bibliography of cost accounting will be presented, references will be given to works where the different types are described.

Just as the analysis of the business into departments is recorded in a permanent form in an organization manual—a record which provides the material for the construction of an organization—so the organization itself should be given permanence by being recorded in the form of an organization chart an illustration of which is given in Fig. 3. It will be noted that various types of organization find places in different parts of the chart and that the principal groups of departments are set off by themselves. The only relationships between functions and departments are those of authority and responsibility, reciprocal relationships in other words. Many a good chart has been spoiled by having too much recorded on it. The basic chart should be supplemented by others on which the lines of coordination may be shown.

The most satisfactory way is to select a single department and group around it the other departments with which it has contacts and then plot the relationships, using different kinds of lines to show the different ones. It will be found that if this is done for a few principal departments and functions no need will be felt for the same kind of thing for the others for all except a few insignificant relationships will be covered.

System for Locating Reference Prints

By Charles B. Johnson

A source of constant irritation and avoidable delay exists in many drawing offices on account of the inability of designers to secure the necessary blueprints or drawings for reference at the time that they are required. Nothing can be more annoying, nor can more easily take a designer's mind from the design upon which he is working, than the necessity of a protracted search for some print that he wishes to refer to at that time.

The more difficult to find, the more desirabie the print seems, and the man determines to have this particular print no matter how much time and energy is expended searching for it. In case he is unable to locate it, his mind is constantly reverting to it and he is continually trying to find it. If it proves absolutely necessary, and the work is indefinitely held up, he, in all probability, calls his superior's attention to the matter, whereupon orders are issued to someone, usually the office boy, to "find that print."

This condition exists in many plants through neglecting to provide a satisfactory system of checking out prints or drawings. In fact, in some organizations it is considered superfluous to have a checking system of any kind. It is needless to say that this is a very undesirable state of affairs, and in such offices efficient work is impossible. The designers and draftsmen are allowed free access to all files, from which they remove drawings or prints as they may require them and then return them at their leisure. This means that they are dumped miscellaneously or carelessly on the top of the filing case, to be refiled later by someone who has a few minutes' spare time and who often is ignorant of the necessity of refiling them correctly. As a result, a great many drawings are misfiled. For all practical purposes, they are lost until someone discovers them while searching for either the particular one or some other.

A system which to a great extent makes it impossible for this condition to exist, is to place someone in direct supervision of the files. Upon a print or drawing being issued, a card is filled out with such information as the name of the person, date and drawing number, and it is filed either alphabetically or numerically. The numerical system has the most to recommend it on account of its ease of installation and the simplicity of maintenance. The party to whom the print or drawing was issued is held responsible for any damage or loss which may occur while it is in his possession.

New Cards Frequently Issued

Periodically, say at least once each week, the person holding the drawing or print should be required to reissue a duplicate card bearing the new date. This system will eliminate the confusion arising from the practice among designers of loaning reference drawings to each other. The one to whom they are loaned neglects returning them or perhaps re-loans them. The result is that where no card is re-issued the files are apt to carry charges against men for several weeks, or possibly months, who have re-loaned the prints.

This condition necessitates an extended search being made, and the party requiring the print usually insists that the searching be done by the party to whom it was originally charged. In either case the resultant loss of time is expensive to the concern, and the designer to whom the print is charged is annoyed by the fact that he must take what he considers valuable time to locate the print—perhaps in the beginning he was forced to find it for himself, and he feels that the one who now requires it should do the same.

If the re-issuance of cards is insisted upon, the files are automatically kept up to date within the time limit set by the issuance of the cards, and thus is eliminated the waste of time which might be more profitably employed. The cards are comparatively inexpensive and may be of any suitable size and design, although it is not recommended that they be so large as to require a bulky filing case. One 2x3 in. should be large enough for all purposes.

Making Expensive Taps in a Railroad Tool Room

By Arthur C. North

The first article on "What's Wrong with the Railroad Shops," reminded me of an experience I had when I was in charge of the small tool room in a railroad shop. This tool room was equipped with a 14-in. x 8-ft. lathe, a 16-in. shaper, a universal milling machine, a small drilling machine and an emery stand.

When I first took charge the general foreman's orders were to make all tools. Not long afterward we needed some regular ¼-in. hand taps. I told the foreman that it would be much cheaper to buy them but the only answer I got from him was a gruff "Make everything."

I did, and they cost nearly fifty cents apiece. They could have been bought for fifteen cents each from any local dealer and would have been available sooner.

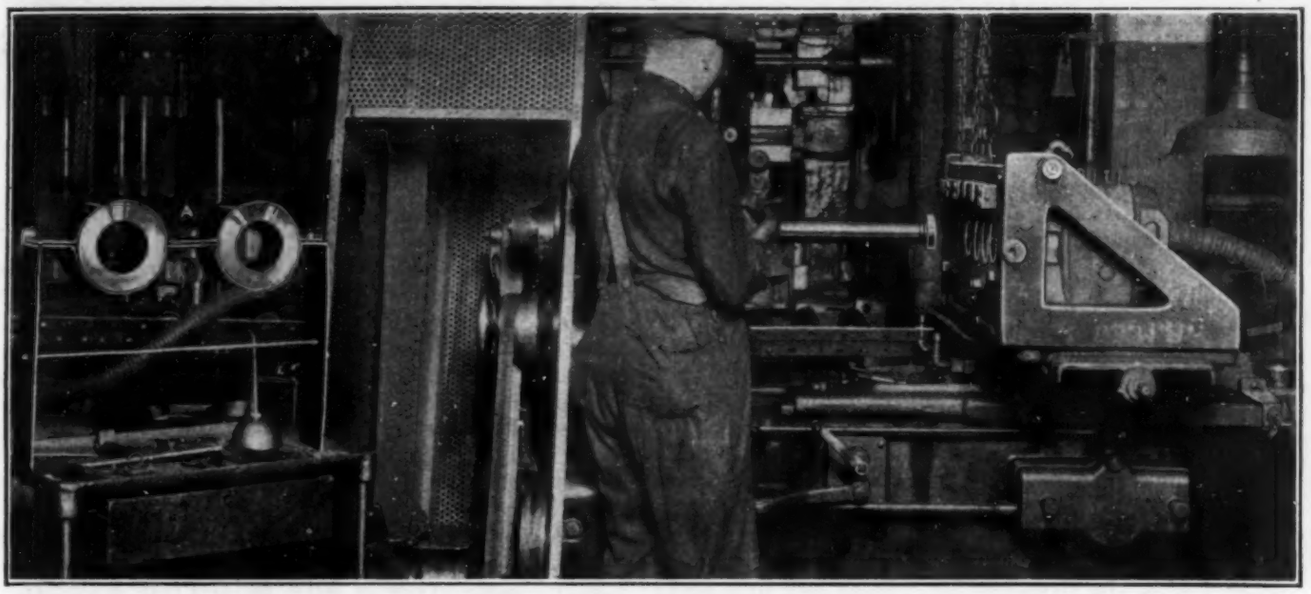


FIG. 1—GRINDING THE PIERCE-ARROW CYLINDERS

Grinding Data from the Pierce-Arrow Shop

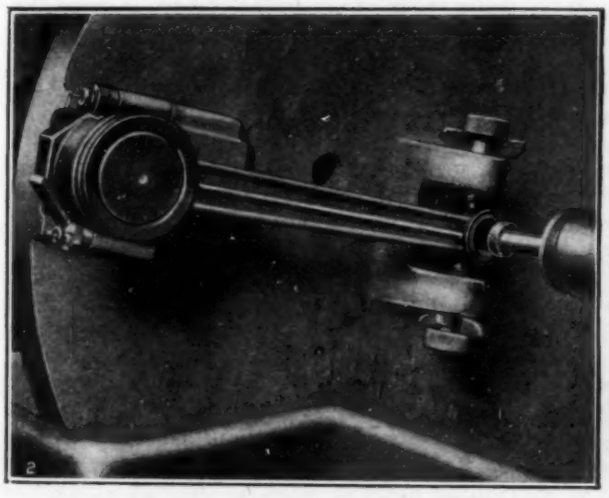
Testing Cylinder Gages—Grinding Bronze Connecting-Rod Bushings—Forming Steering Balls—Grinding Aluminum Transmission Covers

BY FRED H. COLVIN
Editor, *American Machinist*

THE INCREASED use of grinding as a machining method in automobile manufacture is evident in almost every shop one visits. There is also quite a diversity as to the grinding practice, involving wheel speeds, grades of wheels, and similar points. While a wheel surface speed of 6,000 ft. per minute is still considered advisable, there seems to be a tendency in many quarters to reduce this speed to some extent. As one grinding man expressed it, "We talk about 6,000 ft. as a suitable grinding wheel speed. Considering belt slippage and speed variations, however, we are very well satisfied if we get 5,200 ft. in actual practice." In the examples which follow, it will be noted that the wheel speeds vary to some extent, according to the work in hand, as is almost universally the case.

Grinding a Pierce-Arrow cylinder block on a No. 60 Heald machine is shown in Fig. 1. The wheel is 3½ in. in diameter by ¾ in. face, and has a 1¼-in. hole. It is a No. 30 grain and the grade is known as the H-LoTens, by the makers, the Precision Grinding Co. The same wheel is used for both roughing and finishing, the spindle speed being 6,600 r.p.m. The cylinders are bored to allow from 0.015 to 0.018 in. in diameter for grinding. The rough grinding leaves 0.003 in. for finish. The average production is 15 min. for each bore, or 90 min. for the six-cylinder block. This time is from floor to floor, including all handling.

A noticeable feature is the heavy ring gages mounted at *A*, by which the operator tests his inside gages. The ring gages represent the high and low limits. The



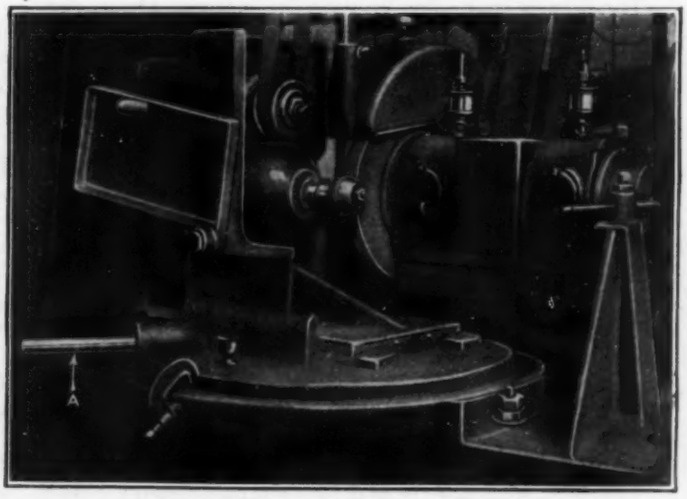


FIG. 2—FIXTURE FOR GRINDING CONNECTING ROD BUSHINGS. FIG. 3—GRINDING STEERING KNUCKLE BALLS

tolerance is 0.0003 in. for both diameter and out of roundness. When the cylinders are inspected, the size of each bore is stamped on the outside of the block as an aid in selecting pistons which shall be just right in every way. This does not mean that the whole dimension is stamped on each cylinder. If the bore is found to be just the nominal size of the cylinder, the block is stamped 0. If it is above or below the nominal size, the exact variation (within the tolerance, of course,) is stamped on the block, with a plus or minus sign before it.

Grinding Bronze Bushings

Another grinding operation is shown in Fig. 2, where the bushing in the small end of the connecting rod is being ground on a Bryant internal grinding machine. The illustration shows very clearly the method of holding the connecting rod. By locating the large end firmly on the pin as shown, and holding the small end lightly between the knurled screws, the hole can be ground not only to the correct center distance from, but also parallel with, the large bearing. Wing lock nuts make it easy to clamp and to release the screws.

The bronze bushing is 1¾ in. long and has a hole 1⅛ in. in diameter. The wheel, an alundum, known as 3,860 K, is 1 in. in diameter with a ⅜-in. face, and has a ⅞-in. spindle hole. The production is 15 rods per hour.

Owing to the desire to have a polished surface in the hole, the final finishing is done with a reamer, 0.002 in. being left for this purpose.

Form Grinding a Ball

The method of grinding one of the balls which form part of the steering mechanism is shown in Fig. 3. This work is done with a formed wheel on a Landis machine. The wheel, an American corundum 54-N, is 12 in. in diameter with 1-in. face. In addition to the face of the wheel being concaved, the work table carrying the ball is swung on its central pivot by the handle *A*. The wheel is dressed by a diamond mounted on the work table, so as to be readily swung past the face of the wheel at the correct radius. The wheel speed is 1,800 r.p.m., and the work speed 400 r.p.m. The stock removed is 0.020 in., and the production is 22 balls per hour.

Still another job, though not illustrated, is grinding the joint face of the aluminum cover for the transmission case. This is done on a Pratt & Whitney vertical-spindle surface grinding machine with a Norton elastic wheel known as No. 46-4. The wheel is of the ring type, 14 in. outside and 10¾ in. inside diameter and 4 in. deep. The production is 25 covers per hour.

Unshackle Business

By J. Bainter

It has been said that ours is the most governed and the worst governed nation on earth with the exception of Russia, and possibly of Mexico. The words were spoken with reference to the legislation that hampers our business activities.

The people of our country seem to believe that all big and little defects in our political, social and industrial organizations can be remedied by legislation. The result has been a multitude of laws that are often conflicting and that leave the business man shackled. The type of regulation that he has been subject to is apt to kill his initiative and prevent the proper development of our national resources. As a shining example, the purpose for which the Sherman Anti-Trust Law was made has been perverted. This law was never intended to interfere with private business, although it is now construed in that way.

The details that come up daily in business are so regulated that the business man does not feel free to manage his enterprise in the way in which he would naturally do it. It is not possible for him to be running to a lawyer with details that come up possibly every hour, and yet that is what is required in order to carry on in strict conformity with the law those activities that are necessary in industry and business.

Certainly a law such as the Sherman Law to prevent those things morally wrong in business, particularly with reference to monopolies, is very desirable. But, public opinion was so aroused by the action of the so-called trusts some years ago that it has not yet had the opportunity of cooling off and examining just what sort of co-operation between businesses is beneficial and what is detrimental. There is beginning to crystallize among business men, however, a sentiment that it is hoped will ultimately have an effect on our laws.

The men who control and operate an industry should be more free to care for their interests in the manner that is best for those interests, provided that nothing is done to injure the public. Slowing up the functions of our business eventually must result to the harm of the country. What can be done about it is not now certain, although the first step seems to be to stop promiscuous legislation regarding business and then to relieve business of some shackles now on it.

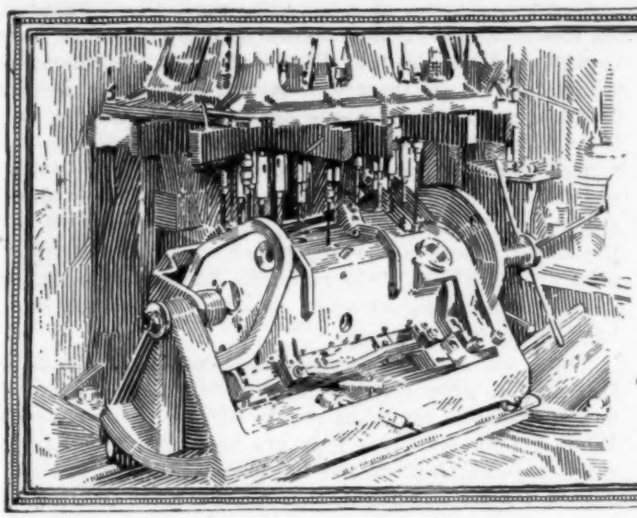
Men Who Make Better Executives

By Frank V. Faulhaber

In selecting employees for promotion in the large machine shop, the man invested with this responsibility may be unduly influenced in his choice by the fact that those he finally picks have shown brilliance in a certain line of work. But, is it wisest to have particular preference for this type of employee? Pay heed to what the superintendent of one large plant has to say on this subject.

"In my many years of experience I have learned that it is not always the best course to place responsibility on the shoulders of what I call the 'special-job men.' The employees I have in mind usually show talent for one line of work and do this very well. I have found that this kind of man does not make the best executive. He is not the man to be chosen because the individual who knows something of the various operations can rightly give better instructions. This being particularly true in the case of the minor operations.

"All due credit to the man who performs one task unusually well. But he is not the man to place in charge of others. It has been found, too, that it is best to keep the man who can do one task well right at his work, for that is his natural bent. His efficiency is otherwise lowered under responsibility. 'Brilliant' men have a tendency to be erratic and that alone is a good reason for selecting for promotion such men as know a little bit of everything and can learn as they go along. In my experience, they have been much more dependable."



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Design of Piercing Dies Concluded—Dies for Formed Work—Multiple Piercing and Perforating Operations—Examples of Dies for Key and Radiator Fin

WHEN work which is to be pierced has been previously drawn or formed, the dies must be constructed so that the work can be located properly and supported so that it will not spring during the operation of piercing. Naturally a great deal depends upon the shape of the work which is to be pierced, but in cases of this kind a nest or seat can be provided in the die into which the work can be fitted. Fig. 486 shows two dies for piercing a piece of formed work. The work *A* shown in the upper example has been formed in a previous operation, and there are eight holes to be pierced in the flange. The construction of the die for this operation is very simple. The shoe *B* has mounted upon it the die *C*, in which the work locates by the outside formed surface in such a way that the flange which is to be pierced lies on the surface of the die.

The punch holder *D* carries eight punches *E*, and these are located and guided in the stripper *F* as shown. The stripper is perfectly held in place by the punches, and its movement is limited by the screw *G*. The required pressure to hold the stripper down is provided through the springs *H*. This example illustrates clearly the action of the stripper plate and punches in connection with a piercing operation of rather simple form. If desired, additional refinement can be obtained by using bushings in the stripper plate.

Another example in the lower part of the illustration shows a die for piercing a hole in the end of the same piece of work. Here the piece is turned over and located on two studs *K* and *L*, which are mounted on a stripper plate *M*. This stripper is so made that it is a sliding fit on the punch *N*, which guides it in its movement up and down. The upper end of the punch locates the work so that as the punch holder *O*, which has the die *P* mounted on it, passes downward, the die *P* strikes against the end of the work and forces the latter down over the punch, thus producing the hole. The pressure pins shown at *R* and *S* are simply used to apply the necessary pressure to support the locating plate. Both of the dies shown in this illustration are used for high production work when progressive operations are performed, yet it may be seen that both operations can be performed simultaneously by making a combination die in which both principles are used at the same time.

When a number of holes are to be pierced in a blank and when these holes are very close together, the method of holding the punches is somewhat different from those which have been previously illustrated. In the example shown at *A* in Fig. 487 there are six oblong slots *B* to

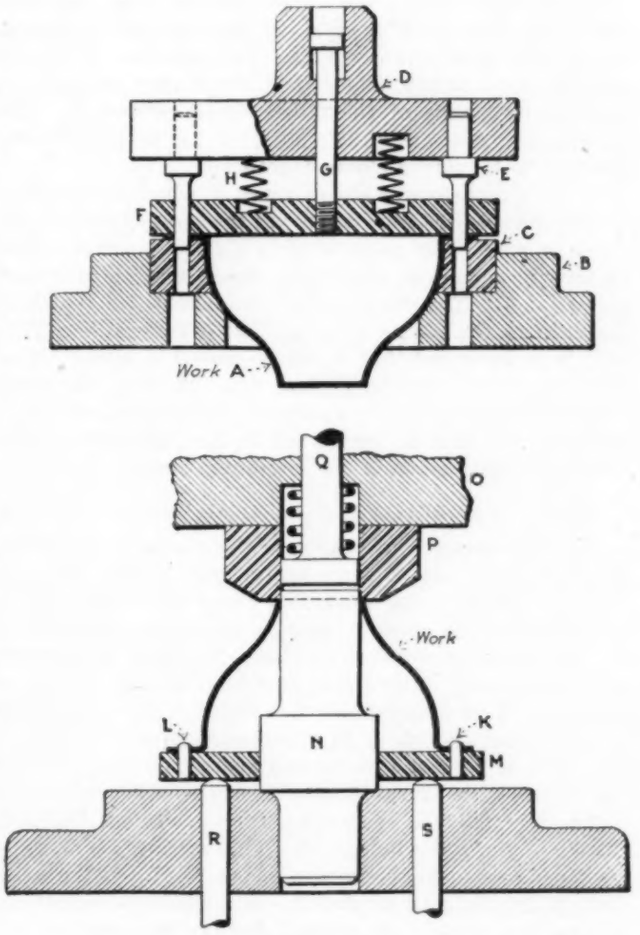


FIG. 486—DIES FOR PIERCING FORMED WORK

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be pierced in the strip indicated. One method of holding punches for an operation of this sort is shown at *C*. The piercing punch *D* is held between the plates *E* and *F*, these plates being fitted into a slot *G* in the punch holder *H* and held in place by the pressure of the set-screw at *K*. The construction of the plates *E* and *F* is

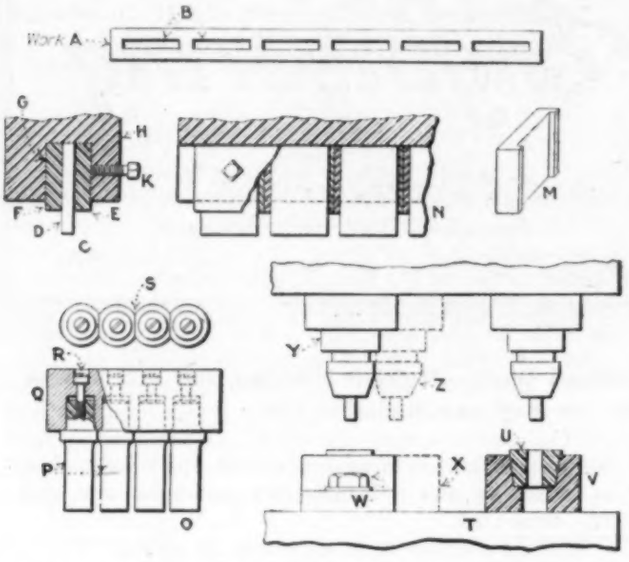


FIG. 487—METHODS OF HOLDING GANG PUNCHES AND ADJUSTABLE PUNCHES AND DIES

clearly shown at *M*, while at *N* is shown the method of setting several of these units in the punch holder.

Round holes which are to be pierced close together may have the punches held in various ways, among which are those shown at *O*. The punches *P* shown here fit into a punch holder *Q* in which they are kept in position by means of the fillister-head screws *R*. The flanges are cut away as shown at *S* to permit the punches to be placed closer together.

Work is occasionally encountered in which the spacing of the holes varies somewhat, yet the piece itself is uniform in size. For cases of this kind it is often satisfactory to design an adjustable punch and die like that shown at *T*. The die *U* is held in a holder *V* which is fastened to the die shoe by means of screws *W*. This unit is so arranged that it can be moved in either direction, as shown by the dotted lines at *X*. The same method of adjustment is applied to the punch and punch holder *Y*, so that it can be set in one direction or the other as indicated at *Z* by the dotted lines.

PERFORATING CYLINDRICAL WORK

Several examples to illustrate the methods of punching various forms of work are shown in Fig. 488. In the example at *A* the work is a silver plate which is to be perforated in order to make a border as indicated at *B*. In punching work of this sort the plate is mounted on an indexing fixture and a section of the border as shown at *B* is punched at each index. At each stroke of the press the indexing mechanism operates so that the plate is turned around and positioned for the next operation. The turning of the work may be done by hand, or it may be operated automatically so that each stroke of the press indexes it. This arrangement would be dependent upon the nature of the work and the number of pieces to be produced. A simple method of indexing can readily be devised for the purpose.

Another example of a piece of work which requires an indexing operation is shown at *C*. This work is an armature disk and the slots to be cut are oblong in shape. When the arrangement of these slots is such that they can be cut in one operation the work is very often done in this manner, although in some cases it is found necessary to punch one or two slots at a time and index the work accordingly. In the example shown the slot *D* is pierced and the work is revolved so that the slot *E* comes under the punch, and the subsequent slots are punched in like manner. The indexing can be done automatically by each stroke of the press or by hand as may be required.

There are special presses on the market for work of this kind so arranged that they can be adjusted to take a considerable range of work within their capacity. When machines of this type are used it is necessary to make up suitable dies and an arbor on which the work can be located. Adjustments are provided so that the center of the arbor can be varied in relation to the ram of the press, thus making it possible to punch work of different diameters without difficulty. The indexing operation is automatically performed at each stroke of the press.

In perforating a cylindrical or formed shape of work like that shown at *F* the method of piercing and the construction of the die are somewhat different from standard practice. The work is slipped over an arbor or a mandrel *G* on which it is free to turn. There is some provision made usually for turning the work, and in the case shown there is a square hole in the end in which the plug locates and turns the work after each

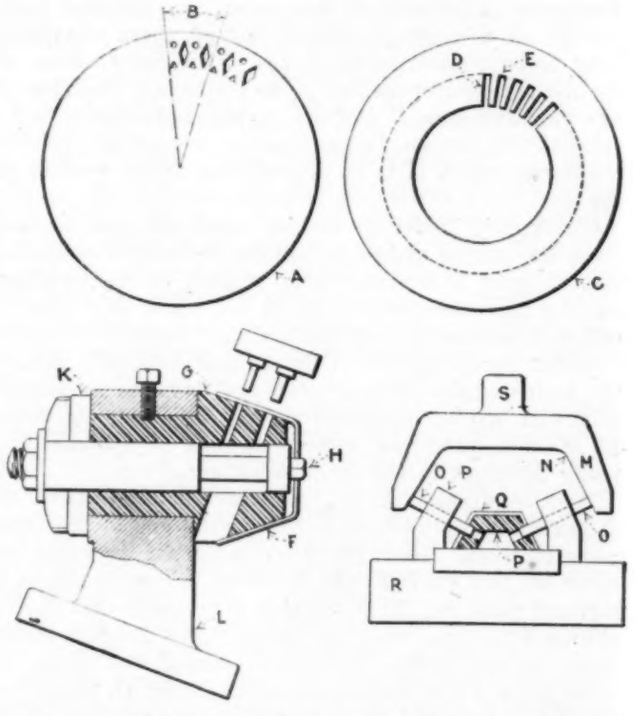


FIG. 488—PIERCING OPERATIONS REQUIRING INDEXING

stroke of the press, by means of the ratchet *K*. The base of the fixture *L* is of cast-iron construction and the illustration clearly shows the operation.

It may be necessary occasionally to provide some means for holding the work on the die so that it will not slip off during the indexing operation. Such an arrange-

ment can easily be made, but it is dependent naturally upon the shape of the work to be punched. There are cases when it is possible to pierce a number of holes in a piece of work with one movement of the punch, but this is not always advisable and a great deal depends upon the nature of the work and the accuracy required.

The punch shown at *M* has an angular face *N*. The

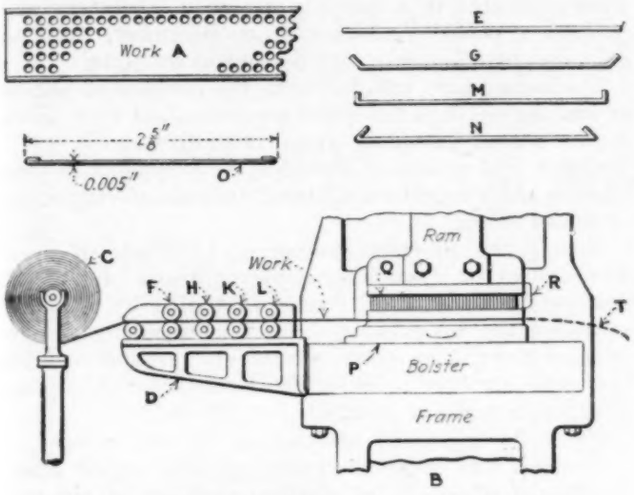


FIG. 489—PIERCING TOOLS FOR RADIATOR FIN

punch is made of steel and finished to the angular shape indicated. It is possible on very large work to make a holder of cast iron in which a steel piece of the required shape is inserted. The work *Q* is held on the die as shown, the latter being mounted in the shoe *R*. The punches *O* are located in accordance with the requirements of the holes on the rim of the work, and as the member *M* moves downward the punches are forced in through the sides of the piece, thus completing the operation. Suitable springs can be provided to return the punches to their original position after the piercing operation has taken place. The punch *M* is held in the usual manner by a shank *S* in the ram of the press. All wearing parts in a die of this sort must be very carefully fitted if accurate work is to be obtained. The thickness of the metal limits the use of this die, and it is only possible to utilize an arrangement of this sort on thin stock.

In Fig. 489 is shown in diagrammatic form the method of piercing a radiator fin. The work shown at *A* is made from 0.005 in. thick brass ribbon stock and there are 95 holes punched in it. The width of the finished work is 2⅝ in., while the length is 19 in. It is necessary to turn over or bead the end of the fin, and the die shown combines this operation with the piercing work and at the same time cuts off the piece to size. The diagram *B* shows the general arrangement of this die. The ribbon stock *C* is held on a reel as shown, and from this it is fed through a series of rolls which are mounted on a bracket *D* of special design, attached to the bolster plate of the press. The appearance of the stock before passing through the rolls is shown at *E*, and after passing between the rolls *F* the two ends are turned up at a 45 deg. angle as indicated at *G*. After this, a continuation of the feeding movement carries the work through the rolls *H*, *K* and *L*, which successively form the material into the shapes shown at *M*, *N* and *O*. In the last roll the shaping is completely finished and the bead turned over, while the stock is reduced to the required width of 2⅝ in. at the same time.

As the stock continues to move forward it passes over the die *P*, so that it is pierced by the punches at *Q*. The cut-off plate *R* is mounted on the punchholder so that it shears the previously pierced piece of work. The method of feeding the stock through the machine is by an automatic friction feeding device which is not shown in the illustration. In this example the stock moves very rapidly and the production is approximately 90 pieces per minute. The finished work drops off the machine after it has been cut off, as indicated by the dotted line at *T*. A suitable box can be attached to the press in such a way that the work will pile up in it and be ready for any further operation. This is an excellent example of modern piercing die construction.

Among the blanking dies described in a previous article we gave an example of a die for blanking a key and the general method of manufacture was also described. After the blanking is finished the piercing operation is to be done, and Fig. 490 illustrates the dies used for this piercing operation. The construction of

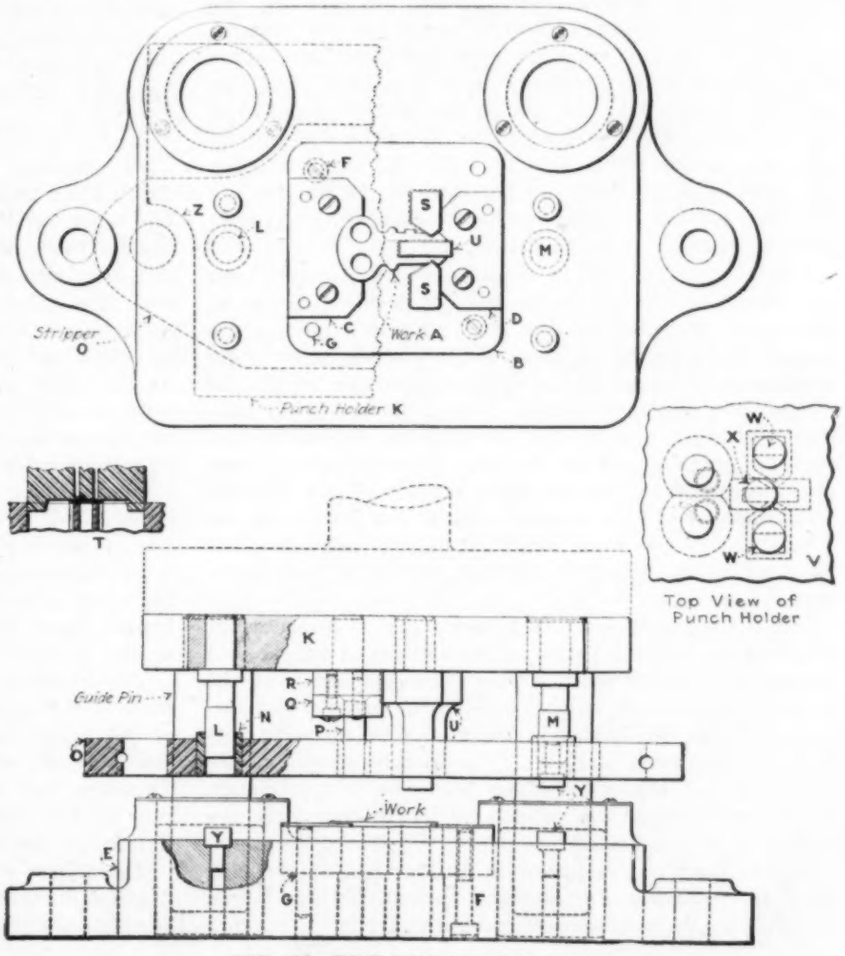


FIG. 490—PIERCING DIE FOR KEY

this die can be very readily understood from the illustration, and several points will be noted in the design which have been spoken of. The work shown at *A* is located on a die block *B* and nested at one end by the set edge *C* and at the other end by the set edge *D*. Button dies cannot be used in this particular case because the holes are too close together. The die block is mounted in a die shoe *E* and held in place by the screws *F*. Location is obtained by means of dowels shown at *G*.

This punch and die are of the sub-press or pillar type and a cam stripper like that previously described is used. The punch holder *K* has two stripper guide pins *L* and *M* which fit into the bushings *N* mounted in the cam stripper *O*. The punches *P* which pierce the two holes are of wire-punch construction, being held by the plate *Q* and holder *R* as indicated. The two punches *S* used for notching the end of the key are backed up in the die block by means of a "heel" which enters the die before the notching operation takes place. The importance of this point has been shown in a previous illustration. The view at *T* shows the construction of the punches more clearly, and illustrates the principle by showing the heel just entering the die block and the notching portion of the punches striking the work. The punch shown at *U* is used for cutting the slot at the center of the key.

Method of Holding Punches and Provisions for Grinding Punches and Dies

At *V* a top view is shown of the punch holder to bring out the general arrangement of holding the punches. The two wire punches used for the holes at one end of the key are off center from the hole. This is often done when holes are close together. The two punches for notching are held in the holder by means of the shank *W* and the punch for the elongated slot is also held by the shank shown at *X*. All these punches are made with flanges, and portions of the flanges are cut away so that the punches interlock each other, thus eliminating the use of locating pins.

One of the features in this die which has not been previously mentioned is the use of leveling studs *Y*, which are mounted on the cam stripper and the die block. The purpose of these leveling studs is to bring up the cam stripper on the downward stroke, so that as the punches descend through it they will be rigidly supported without any chance for them to become forced out of alignment. When the dies become worn so that it is necessary to regrind them the top of the leveling studs must also be reground, and as the studs and die blocks are of the same height it is very easy to place them all on the grinding machine and grind both parts at the same time.

When the punches are to be ground it is unnecessary to grind the leveling studs, as the amount of adjustment necessary to compensate for the stock ground from the punches can be very easily made in the press. The outline of the punch holder in the plan view shows a portion of it cut away at *Z*, which is done to provide ample clearance for the pins which hold the cam stripper. Both cam stripper and punch holder in this view are shown by dotted lines.

It has been our endeavor in this article on piercing dies to illustrate fundamental principles and show graphically the various points of importance in connection with their design.

Ventilation

The report of the New York Commissions on Ventilation, to be published by E. P. Dutton & Co., Jan. 1, 1923, will be in two parts in one volume. The first part will deal with the physiological aspects of ventilation with a review of historical developments in physiological influences of ventilation. The preliminary experiments were conducted in a specially designed laboratory and covered a period extending from December, 1913 to January, 1916 and used 113 persons as subjects.

The second part will deal with the mechanical phases of ventilation, data for which were obtained from work in the period extending from 1915 to early in 1917. Included is a review of historical developments in ventilation and a report on different methods of ventilation of school rooms.

Among the subjects covered are: Effects of overheating, carbon dioxide, exposure to drafts, dry air at moderate temperatures, rooms ventilated by windows supplemented by exhaust flues, fans supplemented by exhaust flues, fans (both supply and exhaust), using the same air over again after re-conditioning, studies of different types of ventilation in schools.

The following is an abstract of the conclusions:

Physical and chemical characterization of air affect health and efficiency, but physical condition of air, particularly as it relates to its temperature, is the factor of prime importance. Moderate and high temperatures (75 and 86 degrees) combined with high humidities, tend to interfere with the normal function of heat loss which gives rise to discomfort. A high moisture content of the air, especially when the air is warm, mitigates against heat loss through the evaporation of water from the skin. A high humidity will therefore reinforce the harmful action of a high temperature.

Vitiated Air To Be Avoided

As compared with fresh air at the same temperature, vitiated air reduced the performance of physical work. The second and more important effect was on the appetite for food. The appetite was found to be measurably and definitely decreased as a result of breathing stale air. The primary essential for good ventilation is the maintenance of a proper air temperature of 68 degrees or below, but without the production of chilling drafts. At the same time, there should be an air change sufficient to avoid the accumulation of odoriferous or other substances arising from human occupancy. The use of windows for ventilating purposes without a suitable means of exhaust for the vitiated air was found wholly impractical. The ventilation of the schoolroom by the use of window inlets and gravity exhaust gave much more satisfactory results. Ventilation by the use of fans and gravity exhaust was found to give better results than any form of window ventilation insofar as the aeration of the room was concerned.

The commission points out that the nature and environment of the enclosure to be ventilated dictate the method of ventilation to be used, and that what is adequate for one type of building may be inadequate for another. Theatres and auditoria, for example, must generally rely on fan systems. Window ventilation would prove inadequate for a school which is overcrowded.

The report states, finally, that the avoidance of overheating is the primary essential of all systems of ventilation and that the most important article of ventilation equipment is the thermometer.

TABLE XII

Switzerland—Imports of Machinery for Working Metal, Wood, Stone, etc.

Country	1909 Quantity q.n.	1909 Value Francs	1910 Quantity q.n.	1910 Value Francs	1911 Quantity q.n.	1911 Value Francs	1912 Quantity q.n.	1912 Value Francs	1913 Quantity q.n.	1913 Value Francs	1914 Quantity q.n.	1914 Value Francs	1915 Quantity q.n.	1915 Value Francs
Germany	27,787	3,708,838	27,825	4,148,354	32,413	4,588,790	35,427	5,116,763	32,834	4,779,723	20,862	3,051,229	8,313	1,259,276
Austria-Hungary	525	57,746	188	19,310	219	22,519	207	27,426	154	18,839	134	18,742	58	5,515
France	587	104,289	871	149,774	1,463	206,408	1,378	265,326	1,097	206,959	2,100	318,928	918	135,166
Italy	258	55,416	208	36,382	257	35,395	171	27,234	125	11,103	39	7,478	41	7,465
Belgium	503	81,223	153	15,825	215	37,950	153	27,460	342	32,170	174	20,272	280	17,630
Netherlands	8	1,040	1	300	44	10,090	2	660	10	2,683	.....	.....	17	3,744
Great Britain	785	144,007	780	211,496	845	152,261	1,052	201,311	962	245,644	536	111,247	130	34,452
Sweden	88	15,304	22	3,615	186	40,317	190	48,464	54	11,705	96	20,730	10	1,900
Denmark	1	94	.....	.....	7	1,500	6	1,200	.....	.....	38	3,970	.....	.....
United States of America	1,797	460,858	1,901	479,495	2,450	674,832	4,942	1,218,331	3,092	895,388	2,319	572,486	1,969	631,060
All other countries	.....	100	.....	25	.....	300	4	389	.....	.....	1	90	2	350
Total	32,339	4,628,915	31,949	5,064,576	38,099	5,770,362	43,532	6,934,555	38,670	6,204,214	26,299	4,125,172	11,738	2,096,558

Country	1916 Quantity q.n.	1916 Value Francs	1917 Quantity q.n.	1917 Value Francs	1918 Quantity q.n.	1918 Value Francs	1919 Quantity q.n.	1919 Value Francs	1920 Quantity q.n.	1920 Value Francs	1921 Quantity q.n.	1921 Value Francs
Germany	19,656	2,958,467	7,999	1,580,130	7,370	1,780,703	54,022	12,336,733	105,457	19,300,232	38,563	7,295,000
Austria-Hungary	218	23,530	51	15,472	.....	.....	1,059	141,874	686	139,556	922	151,000
France	2,235	470,330	516	199,207	65	47,085	538	200,062	1,272	502,207	932	302,000
Italy	20	6,795	18	7,000	.....	.....	71	11,420	298	56,740	123	57,000
Belgium	20	1,600	26	5,212	.....	.....	110	26,550	243	75,274	22	11,000
Netherlands	3	533	.....	.....	.....	.....	1	1,000	17	21,245	17	2,000
Great Britain	176	47,141	488	209,013	314	78,210	94	77,317	616	354,966	426	140,000
Sweden	64	15,270	69	38,552	199	137,626	466	253,535	175	62,266	.....	.....
Denmark	.....	.....	292	129,275	.....	.....	9	2,000	4	1,180	.....	.....
United States of America	4,093	1,465,188	8,447	4,052,082	3,669	1,807,383	3,852	2,074,362	3,080	1,750,717	657	305,000
Czecho-Slovakia	.....	.....	.....	.....	.....	.....	.....	.....	19	1,489	44	4,000
All other countries	.....	.....	3	482	.....	.....	.....	.....	7	2,000	15	3,000
Total	26,485	4,988,854	17,909	6,236,425	11,617	3,851,007	60,222	15,124,853	111,874	22,267,872	41,721	8,270,000

Value of Franc at parity is 19.30c
q.n. = net quintals or 109 kilograms = 220.46 lb.

TABLE XIII

Chile—Imports of Machine Lathes

"Tornos Mecanicos, Varios"

Country of Origin	1912 Quantity Number	1912 Value Pesos	1913 Quantity Kilos	1913 Value Pesos	1914 Quantity Kilos	1914 Value Pesos	1915 Quantity Kilos	1915 Value Pesos	1916 Quantity Kilos	1916 Value Pesos	1917 Quantity Kilos	1917 Value Pesos	1918 Quantity Kilos	1918 Value Pesos	1919 Quantity Kilos	1919 Value Pesos	1920 Quantity Kilos	1920 Value Pesos
Great Britain	6	3,811	26,360	10,544	9,585	3,834	930	372	1,770	750	1,513	1,807	392	300	5,689	7,512	51,390	80,989
Germany	3	1,309	26,230	10,492	5,155	2,062	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6,002	7,593
United States of America	4	1,609	5,450	2,180	7,280	2,912	5,350	2,140	4,208	6,396	68,071	111,556	79,014	157,571	36,349	84,387	65,174	84,566
France	.....	.....	225	90	40	16	.....	.....	.....	.....	97	362	.....	.....	.....	.....	2,224	4,201
Belgium	.....	.....	370	148	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Argentine Republic	.....	.....	.....	.....	165	66	.....	.....	.....	.....	119	174	10,897	30,727	.....	.....	100	686
Italy	.....	.....	.....	.....	.....	.....	735	294	.....	.....	.....	.....	.....	.....	.....	.....	1,400	9,710
Total of Imports	13	6,729	58,635	23,454	22,225	8,890	7,015	2,806	5,978	7,146	69,800	113,899	90,303	188,598	42,038	91,899	126,200	187,745

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Power Required for Shearing Machines

By John S. Watts

The formula given in most textbooks for determining the horsepower required to operate a shearing machine is obtained as follows: First, to determine the force required to shear the maximum size of bar, multiply the sectional area of the bar by its ultimate stress per square inch in shear. For instance, to shear a 4-in. square bar of soft steel having a shearing stress of 50,000 lb. per square inch, will require $50,000 \times 16 = 800,000$ lb. This force is assumed to act through a distance equal to the height of the bar, which in this case will be 4 in. or one-third of a foot; and the work performed each stroke will be $800,000 \times \frac{1}{3} = 266,667$ ft.-lb. At twenty strokes per minute the horsepower needed is

$$HP = \frac{266,667 \times 20}{33,000} = 162.$$

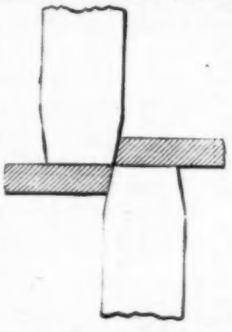
Experience with actual machines shows that this horsepower is very much in excess of that actually used, a 30-hp. motor being quite capable of running the above-mentioned size of machine, which proves that the calculations are incorrect or are based upon erroneous assumptions. Going over the calculations again, we find that there are only two of the factors which can be incorrect, namely, the shearing stress, and the assumption that the full shearing force has to be exerted through a distance equal to the height of the bar. The shearing strength of soft steel, which is taken at 50,000 lb. per square inch, does not in actual practice vary much from this figure. Therefore, it is clear that the error does not lie with this factor, but that we must look for it in the other one.

Consideration of the action of the shear knives shows us that the shearing force cannot but decrease as the knives cut through the bar; and observation of the shearing of large bars proves that the bar is actually sheared completely off long before the moving knife has traveled to the lower edge of the bar. Unfortunately, the forces exerted in shearing are so high and fluctuate with such rapidity during the stroke that it is impossible to devise any means of accurate measurement of them on an actual machine, and we have to depend upon what information we can gather from analysis of the action of the bar being cut.

Let us see what data we can assemble from such a study. If the shear blades were infinitely thin, and cut off the steel by cutting through it, as we would cut off a slice of bread from a loaf, the amount of force needed would be only that required to force the knife into the bar; but this force would be constant until the knife had passed through the bar. On the contrary, the knives have to be of appreciable thickness to stand up to the work; and if it were not for the bar deforming under the pressure, it would be sheared off completely very soon after the knife had come in contact with the upper side of the bar. That is, if the bar did not become deformed before being completely sheared, the force required would be equal to the area of the bar multiplied by its shearing strength; but this force would be exerted only momentarily, and not for the whole depth of the bar.

Anyone who has seen high-carbon steel being sheared will have noticed that the piece being sheared off flies off almost as soon as the knife touches it, with a sound like that from a cannon being fired. What actually occurs is that the knife first compresses or deforms the bar, until the compression has reached a point where further deformation would require a force greater than that needed to shear the bar. At this stage shearing commences and is continued until the molecules of steel are torn apart, or forced past each other to cause a break.

The textbooks to the contrary notwithstanding, it needs no more than a look at a bar which has been sheared, to know that the actual shearing has been done in a small fraction of the stroke. For any resistance to shear to last while the knife travels the full depth of the bar, would mean that there was still cohesion between the two sections of the bar when the sheared bar was as shown in the sketch herewith, which is absurd. For the whole shearing force to be required during the full travel of the knife past the bar, as assumed by the textbooks, would require us to believe that the whole sectional area of the bar being sheared still retained its full shearing strength when the knife was in the position shown, which is still more absurd.



KNIVES FINISHING SHEARING CUT

It is common practice among those familiar through experience with shearing machines to assume that the full shearing force lasts during a distance of one-half the thickness of the material being sheared. While this may be approximately correct for thin material, it is obviously not so for bars, say, 4 in. thick, as the bar is sheared off long before the knife has passed 2 in. into it. From observation and experiment I find that in shearing or punching soft steel, there is first a certain amount of deformation takes place, which under like conditions varies about as the thickness of the material being sheared. By amount of deformation I mean the distance traveled by the knife from its first contact with the bar until it actually begins to cut. This travel is, of course, greater when cutting large square bars with plain knives, than it will be if the knives are notched to fit the bar. The actual shearing after deformation is completed is done practically instantaneously.

The amount of this deformation can be measured on the sheared bars and is found to be approximately

one-quarter of the height. The force required to produce this deformation is necessarily less than would be needed to shear the piece, but is probably not much below it, and the error will be on the safe side if we assume it to be equal to the shearing stress. The conclusion arrived at is that in the formula for the horsepower given in the beginning of this article we should use one-quarter of the thickness of the bar in feet, instead of the whole thickness, and it will be found that the horsepower so calculated will agree quite closely with that commonly used.

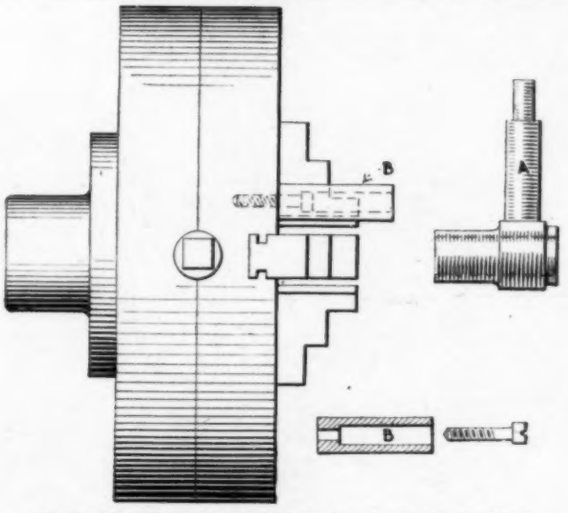
To the horsepower so calculated must be added sufficient to cover the power required to overcome the friction of the machine running idle. This power does not appear to vary in proportion to the capacity of the machine, being very little more for a large machine than it is for a small one, but differing more with the different types of machines. This can be best determined from measurement of the power consumption of a similar machine, but may be taken as around 3 hp. on small machines and up to 5 hp. on the larger ones.

When used for punching there is additional power required in stripping, that is, for pulling the punch out of the hole after punching. This averages about one-half of the power required to punch the hole, if the punches and dies are sharp and in good alignment; if in bad condition the stripping may consume as much power as the punching.

A Lathe Kink

BY WALTER KAUFMAN

A simple expedient for driving a piece of work that was difficult to hold is shown in the accompanying sketch. The part *A*, to be machined, is of brass and requires a hole to be drilled and reamed through the hub. As the part is so light and the wall of the finished



DRIVING STUD ATTACHED TO LATHE CHUCK

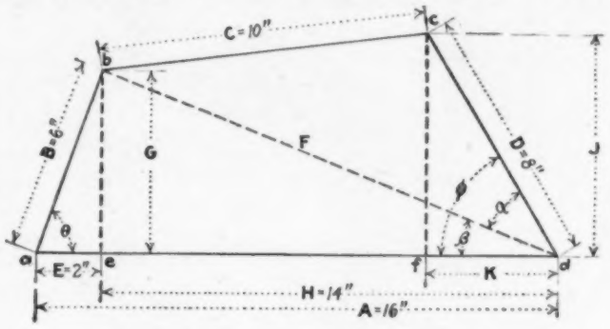
hub so thin, it was impossible to grip it with sufficient force to prevent slippage without distorting it.

To overcome the trouble we drilled out a piece of round cold rolled steel as shown at *B* and attached it to the face of the chuck by tapping a small hole in the latter between two of the jaws. This "stud" now protrudes beyond the chuck jaws and the arm of the work lies against it, thus furnishing the driving power while the chuck jaws have only to hold the work central.

An Interesting Shop Problem

BY H. W. HARDY

Four shafts were to be spaced with their centers at *a*, *b*, *c* and *d*, as shown in the accompanying illustration. The distances *B*, *C*, *D*, *E* and *A* were given, and the distances *G* and *J* had to be found. By joining the centers *bd*, the two triangles *abd* and *bcd* are formed, and by dropping perpendiculars from *b* and *c* cutting



AN INTERESTING SHOP PROBLEM

the line *ad* at *e* and *f*, three more triangles, *abe*, *bde* and *cdf* are formed. These triangles may be solved by trigonometry for any side or angle.

From the triangle *abe* we get

$$\frac{E}{B} = \cos\theta \qquad (1)$$

$$G = B\sin\theta. \qquad (2)$$

From the triangle *bde* we get

$$\text{Tan}\,\beta = \frac{H}{G}. \qquad (3)$$

From the triangle *abd*, by using the well-known formula

$$C = \sqrt{a^2 + b^2 - 2ba\cos C},$$

we get $$F = \sqrt{B^2 + A^2 - 2BA\cos\theta}.$$

From (1),

$$\cos\theta = \frac{E}{B}$$

and $$F = \sqrt{B^2 + A^2 - 2EA}. \qquad (4)$$

From the triangle *bcd*, we get, by employing the formula

$$\cos C = \frac{a^2 + b^2 - c^2}{2ab},$$

$$\cos\alpha = \frac{D^2 + F^2 - C^2}{2DF}.$$

Substituting the value for *F* from (4) we get

$$\text{Cos}\,\alpha = \frac{D^2 + B^2 + A^2 - 2EA - C^2}{2D\sqrt{B^2 + A^2 - 2EA}}. \qquad (5)$$

From the triangle *cdf* we get

$$\phi = \beta + \alpha \qquad (6)$$

$$\frac{K}{D} = \cos\phi;\ K = D\cos\phi \qquad (7)$$

$$\frac{J}{D} = \sin\phi;\ J = D\sin\phi \qquad (8)$$

Substituting the values given for *A*, *B*, *C*, *D* and *E* in the formulas, we get

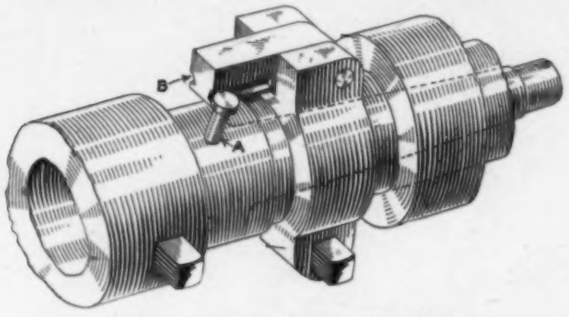
From (1) $\theta = 70$ deg., 32 min.
From (2) $G = 5.65698$ in.
From (3) $\beta = 22$ deg.
From (5) $\alpha = 37$ deg., 22 min.
From (6) $\phi = 59$ deg., 22 min.
From (7) $K = 4.07633$ in.
From (8) $J = 6.88352$ inches.

Holding a Drill Chuck in the Tail Spindle of a Lathe

By W. H. Storey

On page 233 of the *American Machinist*, Charles Kaufmann describes a method of preventing a drill chuck from slipping in the tail spindle of the lathe. At the end of his article he cautions the reader to make the head of the clamping screw of the driving ring the same size as the head of the toolpost screw.

It will be obvious from that caution and also from his illustration that the device has to be removed often; i.e. removed each time a tool other than the chuck is used. It would seem to me that the driving ring would



HOLDING A CHUCK IN LATHE SPINDLE

have to be made much wider than he shows it if it is to have a greater driving effect than the long taper shank of the drill chuck.

In the accompanying illustration the writer shows a chuck driver which need never be removed from the tail spindle because the driving tail swings away to the back of the machine. It will be obvious that this device can be operated in a fraction of the time required to pick up a key and loosen a screw and remove a collar. The driving tail is kept in driving position by the T-headed pin *A* which fits in the slots *B* in the tail whilst the chuck is in use. Two slots are provided so that tools with either right or left hand cutting edges can be held.

Valve Grinding—Continuous or Reciprocating

By H. R. Fowler

A discussion recently arose in the shop as to the best method of "grinding in" valves, particularly referring to fairly good sized steam governor valves, which were being ground in by hand. The man was following the traditional way of grinding, which our grandfather's probably used—a reciprocating motion of the valve *less than a full turn*, a certain number of times, which varied at the fancy of the man—lift the valve clear of the seat—revolve a quarter turn—replace on seat and repeat.

What is the theory of these motions? Do we lift the valve clear of the seat, for any reason except to allow the abrasive to get between the surfaces again? And if that is so, why the reciprocating motion—why not keep the valve revolving in a continuous direction, and possibly get just as good a seat, in less time, provided the valve was lifted from the seat for an instant, every 3 or 4 revolutions?

A certain valve shop has a whole battery of "grasshopper" machines, imitating the old hand method of grinding in seats of globe valves. To be sure the seats are right, but that does not necessarily prove that it is the quickest and best way.

Some of the automobile companies in their instruction books, recommend that in regrinding valves the old conventional way be followed. The continuously revolving way is certainly easier, if done right, than the other way. I've tried it, and would like to hear some one else's opinion on the subject.

[The theory is that by the latter method you correct any "out-of-roundness" in a valve or its seat or both. With valves and seats which are really round, as we now produce them, there seems to be little doubt as to the continuous grinding being just as satisfactory. Editor.]

Holding a Drill on the Center

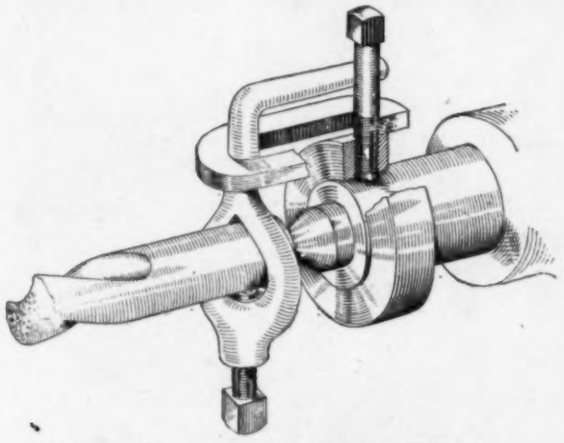
By Harry Moore

A drill hold-back that works very well and does not cost much to make is shown in the accompanying illustration.

The principal part is the collar, which should be fitted nicely upon the end of the tail spindle where it is held by the long screw. A pad or shoe of brass should be placed under the screw to avoid marring the surface of the spindle. The body of the screw acts as the stop against which the tail of the dog rests when the drill is at work.

Slip a lathe dog loosely upon the shank of the drill and put the latter in the lathe with the point against the work and the shank end upon the tail center. Place a link or washer over the body of the long screw and allow it to encircle the tail of the dog also; then move the dog along the drill shank until the "slack" is all taken up and then tighten the dog screw.

As long as the drill is in the work the shank can-



HOLDING A DRILL ON THE CENTER

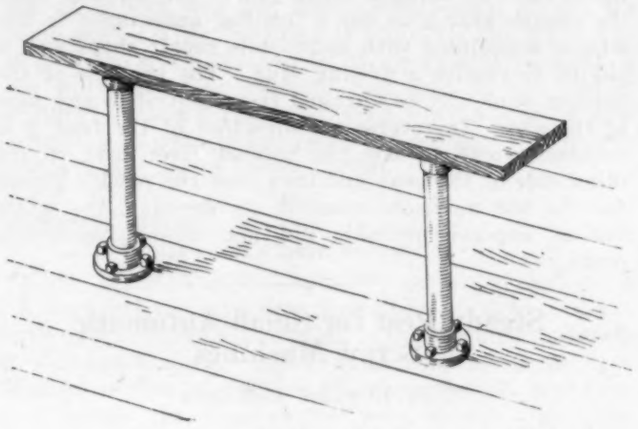
not slip off the center because it will be held by the link, but when the drill is withdrawn it may be lifted out of the lathe without loosening a screw or disturbing the position of any part. One adjustment of the dog will, therefore, answer for many drillings and, as the link positively prevents the shank from slipping off the center, the attention of the operator may remain where it should be—upon the work—an advantage that even a highly skilled man will appreciate.

A Convenient Bench for the Repair Shop

By G. A. Luers

The bench illustrated by the sketch is of a convenient type for the repair shop and is suitable for the heaviest driving and fitting work. It is compact enough not to encroach unduly upon the floor space and it embodies simplicity of construction along with dependable rigidity. Two 3-ft. lengths of 4-in. pipe with flanges at each end form the footing for a 2-in. oak top 14 in. wide and 7 ft. long.

A local shop specializing in the repair and maintenance of heavy trucks uses this type of bench for handling truck parts. Some of these benches are fitted with vises while others are fitted with straightening clamps and gear pullers. The main advantage is that the bench withstands a considerable amount of pounding and driving. The renewal of the top in the event of its breaking is only a matter of obtaining a ready cut section from the nearest lumber yard.



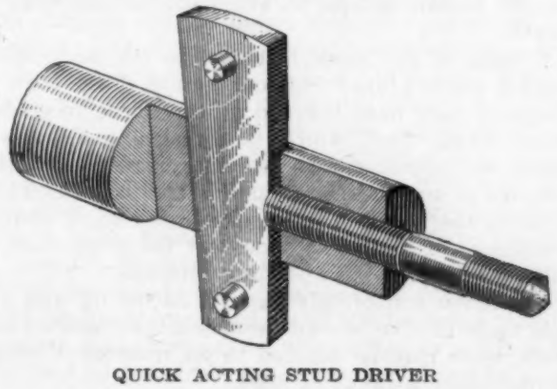
A BENCH FOR THE CENTER OF THE SHOP FLOOR
PORTABLE BENCH MADE FROM SHEET METAL AND PIPE

A Quick Acting Stud Driver

By Lee Jackson

Some machine shop operations have not changed in a good many years. At least, not in some shops. For instance: for the last twenty years I have seen studs inserted with just one kind of a driver. That was a piece of hexagon stock with one end tapped to receive the stud, and the other to receive the locking set screw. This driver was placed on a stud and used as a wrench grip to screw it in place, then it usually required two wrenches to remove the driver from the stud.

But, the other day I saw what to me was a brand new idea in a stud driver. It was made from a piece of round steel about 15 in. long and had a smaller piece of round steel about a foot long through the upper end for a handle. In this respect it resembled a socket wrench. The lower end was tapped to fit a stud and a wedge of hardened steel inset in a rectangular hole through the driver so it would slide endwise freely was used as a lock. But it worked as smoothly as a worn out file. Studs were inserted about as fast as nuts are ordinarily put on as no time was lost in removing the driver. When a stud was tight a tap on the small end of the wedge loosened the driver and the tool was spun off. The accompanying sketch shows the business end of the driver. The shank and handle you can provide to suit your needs.

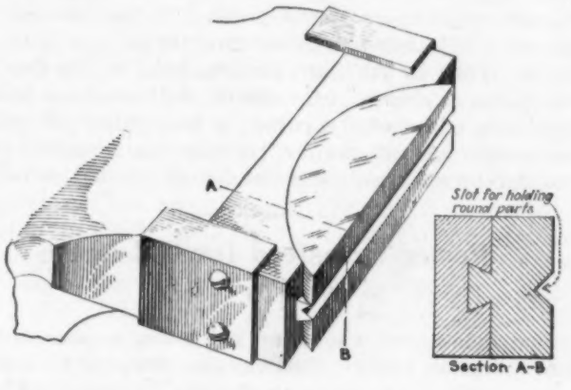


QUICK ACTING STUD DRIVER

Self-Aligning Vise Jaw

By G. A. Luers

While the ordinary bench vise is an admirable all-round tool for holding most of the work that comes to it, there are times when tapered keys, shafts or other parts (the opposite sides of which are not parallel) are to be worked upon and then the vise is useless without cobbling it up with loose pieces to make up for the inequality. Machinists who have tried to hold such work in the vise and fervently wished for three hands with which to accomplish the job will appreciate the advantage of the simple auxiliary jaw shown in the appended sketch.



AUXILIARY VISE JAW FOR HOLDING TAPERS

A block of suitable material is clamped to the faceplate of a lathe, the inner face bored to a large radius, and a dovetail groove machined in it. Another block of steel is then so clamped to the faceplate that when turned its convex surface and the tang to fit the groove machined upon its radii will match those of the first block. The flat surface of thesecond block ma be checked if desired to match the face of the movable jaw of the vise, and a V-groove should be planed along it, as shown, to facilitate the holding of round tapered work.

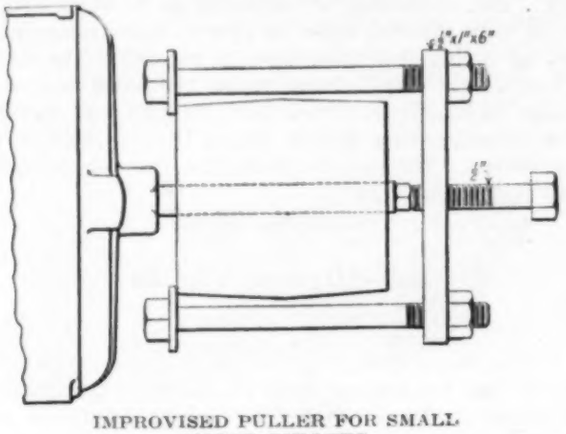
The end pieces to retain the device in position may be made of heavy sheet metal and fastened to the block with countersunk head screws. This little appliance has saved no end of trouble and is one that can be made up in any shop, on account of its simplicity.

Puller for Small Motor Pulleys

By Waller L. Kaufmann

We have several one-quarter horsepower motors in our shops which have small cast-iron pulleys, about 3 in. in diameter. When repairing one of these motors the other day I found the pulley had been put on very tight, and not having a puller I made the little device shown in the sketch in a very few minutes.

I took a piece of steel about ½ in. x 1 in. in section and



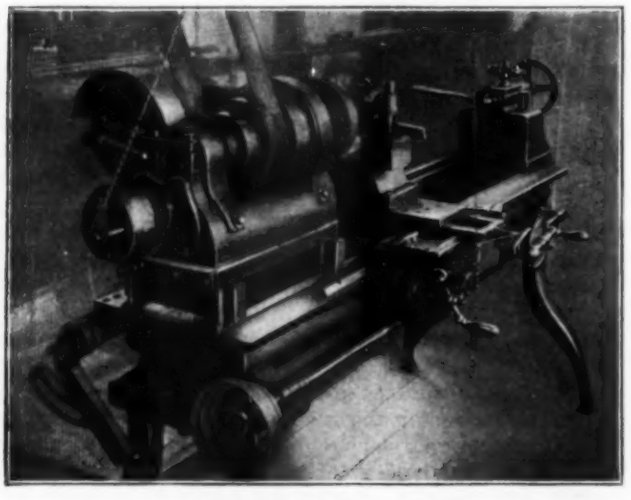
IMPROVISED PULLER FOR SMALL MOTOR PULLEYS

about 5 in. or 6 in. long, and drilled two ½-in. holes far enough apart to span the pulley. I then drilled and tapped a hole between these two for a ½ or ⅝-in. cap screw. Then by putting two ½-in. bolts in the two outside holes, as shown in the sketch, with washers to hook under the edges of the pulley, it was pulled off quickly and easily. A nut was put between the armature shaft and the cap screw so the center would not be spoiled.

Power Crossfeed for Old Lathe

By William Clancy

The illustration shows an old lathe, resurrected for use in a small garage, that has been fitted with a power



IMPROVISED CROSSFEED

cross feed to enable the garage man to attend to other jobs while the lathe is taking a facing cut.

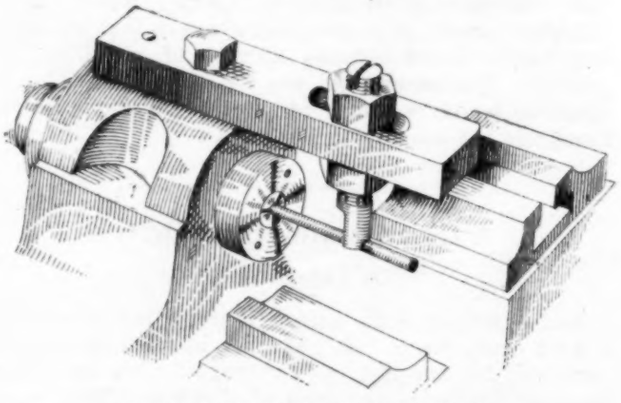
All of the parts used except the chain either came out of the scrap or were parts of the lathe. The bushing through which the crossfeed screw passes was shortened to expose a sufficient length of the screw to allow for keying on one of the change gears and also to make room for the ratchet lever, which is a piece of cold rolled sheet steel, bent to the desired shape.

The end of the ratchet lever is slotted to allow a link of the chain to slip in sidewise, and the effective length of the chain may thus be increased or shortened to meet requirements. Any change gear on the lathe may be used as a ratchet and, as the diameter of the gear is a factor in the resulting movement, the amount of feed per revolution may be graduated to very small increments by using a large gear. The casting upon the change gear stud has a familiar appearance to one who is acquainted with automobile repair shops and is slotted to receive a driving stud. The position of the driving stud may be changed from central to any part of the slot. To reverse the direction of the feed it is necessary only to flop the ratchet lever over to the other side of the gear and turn over the pawl. Except for the odd moments spent in its devising, the whole bill of expense probably did not exceed twenty-five cents.

Steady Rest for Small Automatic Screw Machines

By Edward A. Hazen

In drilling holes in the end of small work made from bar stock in the automatic screw machine, difficulty is often encountered in getting the drill to start centrally owing to the slenderness of the work and its consequent liability to "dodge" when the drill comes into action.



STEADY REST FOR SMALL WORK

The sketch shows a steady rest that I made for the No. 00 Brown & Sharpe automatic to overcome this trouble.

A piece of flat stock is bolted to the main spindle-bearing cap to project over and parallel to the work. An elongated hole near the end of this piece receives the round steady rest, which is threaded nearly its full length and provided with two nuts by which it may be adjusted to and clamped at any desired height. The bar carrying the steady rest must be high enough above the tool blocks on the cross slide that the cross slide tools will pass under it with out interference.

The lower end of this piece is flatted off and a half hole made in it as shown, to match the diameter of the work, or it may be notched to an inverted V-shape to accommodate a range of sizes.

Editorial

THERE ARE FOUR varieties of workers and we find all four kinds in almost every shop. Some are slow and do poor work; some do the work just as poorly but produce more; some are slow but do good work and a few do the work both well and fast. Why should all get the same pay? What incentive is there for the good man to give the world the benefit of his greater capacity if the world gives no more to him than to his poorest brother? Don't forget that, even when a man is paid according to what he produces, he who gets the highest pay will still be the cheapest man.

Investing Money to Improve Machine Work

THE MANUFACTURER who earnestly desires to turn out the very best product in his field, is beset with many difficult problems. The greatest problem is perhaps financial rather than mechanical. A case in point is that of a maker of special cutters of a type that is still far from perfect even though they have been used for many years.

A large user of this particular kind of cutter has made extensive experiments and developed a standard which has given the best results. The standard is not easy to make and most of the makers of this kind of cutter have made no serious attempts to follow it. They make cutters galore to be tried out, but fail to conform to the standard.

One maker, however, and not one of the largest either, has made a careful study of the situation and has spent approximately $50,000 developing a method of making the cutters of the desired standard. And this in spite of the fact that the maximum business of this concern will not exceed $10,000 a year. Here is where the financial problem comes in.

The cutter maker is staking present expense against future orders, not only from the one concern but from others who will probably demand the special type of cutter later on. If the demand for better cutters materializes, as he evidently expects it will, he will be in a most advantageous position to supply them. But on the other hand he is perhaps running the risk that other firms, who have not invested $50,000 in experiment, will profit by his work along this line.

The chances are, however, that the knowledge and experience gained in this development will place him in a position to profit in the years to come. When it becomes known that he can furnish these special cutters with a certainty of their being right, users who are educated to the point of knowing what they require will not bother with experimenters. The man who knows how to make them should get the business—and it is to be hoped that the pioneer along this line will have his business so organized as to cash in on the large investment already made. He deserves a rich reward for his courage and his efforts to better machine production, and there can be no question as to his being in the most advantageous position to secure new business.

The Need of Federal Control of Aircraft

THOSE WHO are doubtful as to the coming of air transportation in the near future will do well to read the reports of the First National Air Institute meeting held in Detroit, Mich., and the proceedings of the Second National Aero Congress which followed it. Both of these documents are extremely interesting and show just where we stand in aviation. They also show where we can stand and ought to stand, if we are alive to the situation as it now exists.

As pointed out by Howard E. Coffin in his foreword, "No comprehensive, definite or continuing policy of aeronautical development can be had by us except through an orderly pressure of national sentiment resulting from an educated public mind. Federal laws, the control and regulation of all aircraft are of immediate and crying need. An authoritative Federal agency must be established to examine and license both pilots and aircraft in any commercial or private service. Federal inspection of all aircraft for airworthiness must be provided."

It is not at all creditable that we, the pioneers of aviation, are the only great nation which has not subscribed to the International Air Code which covers the points made by Mr. Coffin, our lack of participation being entirely due to a partisanship which comes very near being criminal. An American plane landing on Canadian soil or on Canadian waters, is practically an outlaw and has no standing. Nor is it permitted to resume its flight until it has been inspected for airworthiness and the pilot likewise examined. Such lack of co-operation, for which we are solely responsible, does much to hinder aviation along the border.

Progressive cities and towns are providing landing fields at convenient points. These should be near enough together to permit a pilot's reaching one of them in case of motor failure. The time is not far distant when these fields must be illuminated for night landing.

Aviation is here to stay. The rate of its development depends largely upon Federal control and the providing of landing fields. Every community can do its share to help it along—and it all makes business for the country.

Just Suppose

JUST SUPPOSE that you, as the manager of a small jobbing shop, had an emergency job come in that demanded of you certain technical information that you didn't have. Suppose further that you wrote to two concerns from either of which you would have bought the part needed if the case had not been one of emergency, and asked them to give you the information you wanted.

Now suppose that one of them sent it back by return mail while the other one hesitated a while and finally said it couldn't let you have it.

If somebody asked you to recommend one of these concerns, it doesn't take much supposing to guess that you would strain a point to recommend the one that wasn't afraid to come out of its shell, does it?

Shop Equipment News

Kobert Type-NB Dual-Head Electric Riveting Machine

The dual-head electric riveting machine made by the Kobert Machine Co., Inc., 50 Church St., New York, N. Y., has recently been redesigned, so that it appears as in Fig. 1, which gives a view of the Type-NB machine. The new model is, of course, similar to the former one and is distinct in type, since an upper tool of construction peculiar to the Kobert machine is employed.

A copper electrode is placed on the right, and a steel heading set on the left. Heating of the rivet is done by passing a current through it when resting on the horn and held down by the copper electrode. When the heat has progressed sufficiently, the head is moved laterally 1¼ in. to bring the steel heading set or ram over the work, which does not change its position. The head of the rivet is then formed under pressure. The machine is motor-driven to provide the necessary pressure on the work, and the control is provided by one pedal, so that the hands of the operator are free to manipulate the work. The machine is adaptable to a wide variety of work, both in its standard form and with special fixtures.

The overhanging column and base are one member, on which all parts of the machine are mounted. The horn or lower electrode is water-cooled, the water being circulated from a pipe line connected to the shop water supply. A screw is provided to vary the height of the horn. The construction is such that the entire front of the machine can be stripped, thus giving room for special fixtures to suit the work.

All rivets are heated in place; that is, they are assembled in the holes in the work and then placed on the horn of the machine. In this way, handling of hot rivets when inserting them in reamed holes is eliminated. By heating the rivet in place, the metal around the hole is expanded; and it contracts upon cooling, so as to make a very tight fit on the rivet. Electric heating does not cause oxidation and scaling of the rivets if proper care is given to the process.

The upper electrode also is water-cooled. The material is copper, since it has seven times the conductivity of steel. Both electrodes are connected to the transformer in the machine by means of heavy wire cables to reduce electrical resistance. There is no attempt made to apply pressure by means of the copper upper electrode.

The steel heading set comes down on the rivet in a line parallel with its axis. There is no vibration in the machine, as the blow is not repeated and consists chiefly of the application of a steady pressure. The operation is noiseless; it consists principally of bringing the rivet to a cherry red, and then forming the head immediately. Setting the rivets while hot requires a pressure only one-eighth as large as when done cold. Furthermore, the crystallization of the metal that is apt to occur in cold setting does not take place. The riveting can thus be performed as quickly, and, it is stated, more quickly in some cases than cold riveting can be done.

To operate the machine, the operator places the work with the rivet already assembled in it on the horn of the anvil, and then depresses the pedal. This action causes the copper electrode to descend and make contact with the upper end of the rivet. Further movement of the pedal closes the electric circuit by means of the contact that can be seen on the right of the head.

As soon as the rivet has reached a glowing red, as in Fig. 2, the foot pedal is released. The first action due to this movement occurs in breaking the circuit by means of the spring in the switch mechanism just referred to. It should be noted that this switch is merely a master

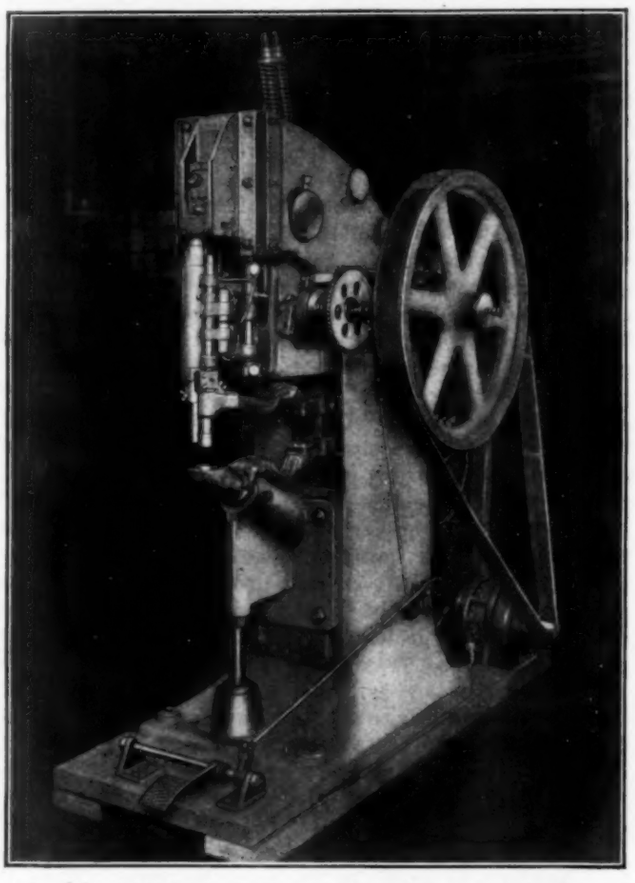


FIG. 1—KOBERT TYPE-NB DUAL-HEAD ELECTRIC RIVETING MACHINE

or controlling switch, and does not itself break the current for the electrode, as this break is made in the primary circuit. The electrode itself then breaks contact with the work. The advantage of this arrangement is that the electrode does not make nor break contact with the work while the current is on, so that no sparking occurs.

When the electrode completes its up-stroke, the clutch in the drive is automatically tripped, thus operating a

cam on the left side of the machine and throwing the heading set into a line directly over the rivet. The head immediately descends, forms the rivet head, and returns to its upward position on the left.

The operation is very rapid, and the average time for heating a $\frac{3}{8}$-in. rivet is stated to be approximately 3 sec. It should be noted that the operation is largely automatic, as the only function of the operator, aside from seeing that the work is properly located, is to

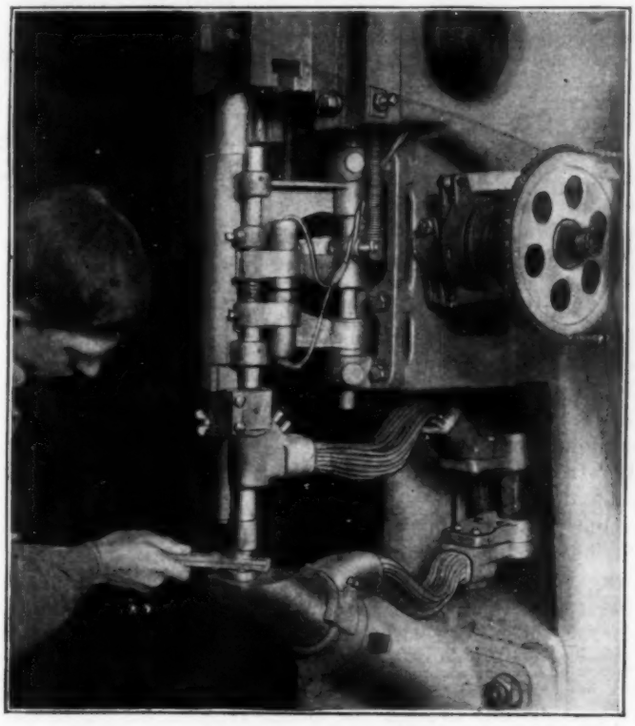


FIG. 2—HEATING RIVET IN KOBERT MACHINE

press on the pedal. The pressure required is only 1 lb., a feature that should tend greatly to eliminate fatigue.

The machine is driven at constant speed, either from a lineshaft or from an individaul motor. By means of the clutch previously mentioned, the power mechanism can be engaged so as to cause the descent of the riveting head. This drive mechanism incorporates a feature worthy of note. By means of this feature both the maximum pressure exerted can be controlled, and a safety device is provided so that nothing in the mechanism will be injured even though the descent of the riveting set is blocked. The drive from the crank on the drive shaft to the ram takes place through a "walking beam" that is so fitted with a spring-loaded toggle mechanism that the ram can be held while the crank turns, without breakage of any parts. The release mechanism does not come into play until the pressure under the heading set exceeds the maximum for which the mechanism has been adjusted.

The advantage of this construction is that the ram is usually so set that when the crank is about 80 per cent through its possible stroke, the rivet is home. Throughout the rest of the travel of the crank the ram dwells on the work so as to press the parts securely together. Should an additional thickness be placed between the riveting points, a longer rivet may be interposed and driven home, because the machine automatically compensates for the additional thickness.

The current necessary to operate the heating element is naturally of the alternating type. It is transformed to a voltage from 4 to 6 to pass through the electrodes. Control or switch panels separate from the machine, such as in Fig. 1, control the amount of current that is employed for different diameters of rivets. The cost of energy for heating is small, since 1,000 $\frac{1}{4}$-in. rivets are stated to consume not more than $1\frac{1}{2}$ kw.-hr.

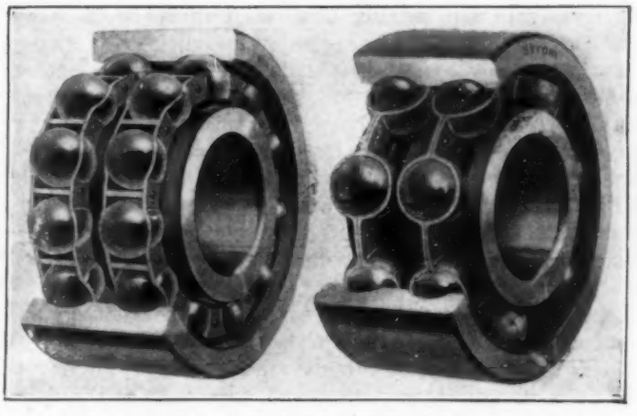
Pre-assembling is advocated in practically all cases, to facilitate rapid operation. Ordinarily, the work requires only one operator or an operator and one assembler. Special fixtures can be developed for parts made in very large quantities and for operations having special requirements. In some cases the machine can be made horizontal. For work such as on roller chains where the pin itself has been heat-treated and must not be heated in the riveting, the current is not passed through the entire rivet, but the ends of two pins are heated simultaneously, with the current passing through the link.

The Type-NB machine which is illustrated is intended for use on rivets from $\frac{1}{4}$ to $\frac{1}{2}$ in. in diameter. The machine has a 10-kw. transformer, and is ordinarily driven by a 2-hp. motor. The throat depth is 18 in. The machine is 76 in. high and requires a floor space of 39 x 28 in. It weighs 4,000 pounds.

The Type-NC machine is similar in principle, but is intended for rivets from $\frac{1}{2}$ to $\frac{3}{4}$ in. in diameter. Due to the fact that it is back-geared with a ratio of 6 to 1, a higher flywheel speed is employed. The transformer has a capacity of 15 kw., and 3-hp. are required to drive the machine. The throat depth is 24 in. The height of the machine is $83\frac{3}{4}$ in., while a floor space of 49 x 36 in. is required. The weight of the large machine is 5,800 pounds.

Strom Double-Row Radial Ball Bearings

Double-row ball bearings for radial load have recently been added by the U. S. Ball Bearing Manufacturing Co., 4535 Palmer St., Chicago, Ill., to the line of single-row radial, angular contact and thrust ball bearings made by the concern. Two types of bearing are fur-



STROM DOUBLE-ROW BALL BEARINGS OF STANDARD AND MAXIMUM TYPES

nished, the standard and the maximum. The standard bearing is shown at the right of the accompanying illustration, while the bearing for maximum service, which contains more balls than the standard type, is shown at the left.

One of the principal features of the bearing is the construction of the retainers. Independent riveted re-

tainers are employed for each row of balls, so that the same strength is obtained in each retainer as in the single-row type of bearing.

The bearings are stated to be especially adaptable for installations requiring large bearing capacity in a limited mount of space. Although intended primarily for carrying heavy radial loads, a thrust load of 25 per cent of the maximum radial load can also be withstood. The maximum type bearings have capacities 25 per cent greater than the standard type. The bearings are made in a range of sizes from 10 to 110 mm. bore (0.394 to 4.330 in.).

How to Secure Co-operation

BY ENTROPY

In all my rambles about the shops of the east in the past 30 years I have never seen what could be called complete co-operation in any organization. Some of the poorest examples were in places where the manager thought he had it, but where as soon as the veneer was broken through and the real state of the shop was seen, there was no co-operation at all, only the eye service which so often lulls the head of a plant. In other cases there was nearly complete co-operation within the shop but mostly in opposition to the management.

The nearest to good co-operation seems to lie in places where the plant is not too large for one man to dominate and where the one man painstakingly selects and trains his subordinates into a sort of hero worship of himself. This kind of co-operation does not always lead to the greatest profit. Perhaps the most profitable organization is one wherein each superintendent or department head is capable of carrying on his own work without supervision and where the different departments are so distinct that only a little co-operation is necessary. One way to secure the object is not to ask for too much of it.

It is very often necessary, however, to assign to someone duties and responsibilities which might equally well be given to any one of two or three parts of the organization. In that case whoever does not get them, if they are prized, is sure to at least inwardly, wonder why he did not have the coveted privilege. It takes a rather strong man to sit still and see someone else make a "mess" of a good job, especially when he thinks that he himself would have been able to make it a success. Such men, according to their size, are likely to say, "Well, let's see how soon the other chap will hang himself with his own rope." And even if the other chap does not hang himself, they are not likely to become more reconciled to the arrangement as time goes on.

A shop of over five hundred men cannot usually be dominated by one man. There are exceptions, but it is very seldom that one man can remember all about even five hundred workmen and foremen, and unless there is remembrance there is not acquaintance, and if there is not acquaintance there is not much co-operation. Strangers do not co-operate except under pressure of necessity. Intimate acquaintanceship and respect seem to be the essentials to co-operation. Respect may be due to intellect or to sentiment or even to emotion, that is, "the old man" may be so capable that everyone feels willing and safe in trusting to him for guidance. No one may think of thinking for himself. Such a form of co-operation is unsafe, for when the one man wants to retire or death does retire him, there is a void that is not usually filled at once. The second, sentiment, is often given to the son of the intellectual giant of the first instance. Often it is misplaced but it certainly gives the second generation a chance worth taking to assume the reins of leadership. The third is not so often seen in business as in politics where men often are elected and re-elected for purely sentimental reasons and not because they make the best officers. In the shop we see the same thing in the retention of loyalty to old men long after they have been retired from active participation in the business. That kind of loyalty and its attendant co-operation are just as valuable to the firm that can command them as is either of the others.

Of course the ideal situation would be to combine the three. The head of the firm should be of that highly intellectual type that is always right and yet does spectacular things with ease. He should command co-operation through some sentimental thing even if only because he married the daughter of the founder of the firm, and he should appeal to their emotions if only by an appearance of that austere dignity softened by an occasional unbending at the death of some old workman or similar event that makes the workmen respect his emotions. The combination is so rare as to be almost unknown, but the nearer a leader comes to this ideal the stronger and more vital the co-operation which he commands.

One thing which does not secure co-operation is for the head of the firm to hive himself up in his office away from his employees. Very few firms have been able to overcome the handicap thus established, and most of those have had some man who though not nominally the head was accepted as such by the subordinates, and who made his personality a direct asset to the firm by getting out around the plant frequently. True, a man may have great intelligence, an intimate knowledge of a business and yet have a personality such that he cannot inspire the confidence of workmen and people in general. If the choice of executives narrows down to such a man, it is absolutely necessary that he work in co-operation with some man who can represent him before his own employees, and who as spokesman for him will supplement his weaknesses.

CREDIT MUST BE PROPERLY PLACED

If the majority of employees were naturally co-operative the problem would not exist, but unfortunately too many people have found that they get very little that they do not earn, and they find too many piratically inclined associates who do not hesitate to appropriate to themselves the credit for improvements made by others if the opportunity offers. After seeing some one else carrying off credit for his inventions and suggestions almost anyone is likely to make sure that nothing of the kind happens again. Consequently many shops hardly get a helpful constructive suggestion from their employees from one year's end to another. A suggestion box does no good. The only thing that can help is the confidence that the men at the head of the organization will insist that every superintendent and every foreman give credit where credit is due and not elsewhere. In other words, the manager who secures co-operation must make sure that his personality, and his good character, and reputation for fair play are transmitted to and through every minor executive in the plant.

News Section

American Machinist Editors Meet in Annual Conference

The *American Machinist* editorial staff got together for its annual conferences on plans for the new year on Dec. 18, 19 and 20. Ethan Viall came in from Cincinnati, Howard Campbell from Chicago and Ellsworth Sheldon from New England to talk over with the New York men the features to be included in the two coming volumes of the *American Machinist* and various other editorial problems.

On Monday evening the staff had dinner together at Brown's Chop House and went on to the theatre afterwards. Tuesday noon they had lunch at the Engineer's Club with Mr. McGraw and vice-presidents Mehren and Britton as their guests. At the luncheon Mr. Britton outlined the circulation problems affecting the industrial unit and particularly the *American Machinist*. Mr. Mehren described the new unit system under which the company is now organized and explained the reasons for its adoption and its method of functioning. Mr. McGraw wound up the gathering with an inspirational talk on editorial duties and opportunities.

The conference was decidedly successful and plans for adding a semi-annual conference at which the advertising solicitors and the field superintendents would also be present are under consideration.

Welding Society Holds Monthly Meeting

The Metropolitan Section of the American Welding Society held its regular monthly meeting in the Engineering Societies Building, 29 West 39th St., New York City.

The meeting was well attended and much interest was shown in the two excellent papers presented to the members. A. S. Kinsey, professor of Shop Practice, Stevens Institute of Technology and advisory service engineer for the Air Reduction Sales Co., read a paper entitled, "Applications of Cast Iron Cutting by the Oxy-Acetylene Torch," and E. S. Eldridge, welding foreman, Kingsland Shops, D. L. & W. R.R., talked on "Practical Welding."

S.A.E. Annual Meeting Is Announced

The annual meeting of the Society of Automotive Engineers, according to an advance announcement made last week, will be held in New York City, at the Engineering Societies Building, 29 West 39th St., Jan. 9 to 12, 1923.

The National Automobile Show will be held concurrently at the Grand Central Palace from Jan. 6 to 13. Through the courtesy of the National Automobile Chamber of Commerce tickets will be distributed gratis to S.A.E. members attending the annual meeting.

The Automobile Body Builders' Show will be held at the Twelfth Regiment Armory from Jan. 8 to 13. Tickets for this Show have been provided for S.A.E. members attending the Annual Meeting through the cooperation of the Automobile Body Builders Association.

These two shows will include all of the latest developments in passenger-cars, passenger-car bodies, automobile accessories and equipment. Combined with the S.A.E. meetings they represent an unusual educational value to all automotive engineers and executives.

Mason Britton Elected Vice-President of McGraw-Hill Company, Inc.

At a meeting of the executive committee of the McGraw-Hill Co., held on Tuesday, Dec. 19, Mason Britton was elected a vice-president.

Mr. Britton entered the circulation department of the *American Machinist* on Feb. 10, 1901, going from there to be assistant advertising make-up. He was next transferred to the production department which at that time was in a different building. Part of his duties consisted of taking care of some of the production accounts.

The next move was back to the make-up department where he soon became head make-up and handled both the advertising and editorial pages of the *American Machinist*, writing advertising copy to occupy spare moments. He was later sent to the advertising service department and became manager of that department in a short time.

Then came an opening as business manager of the *American Machinist* and Mr. Britton received the appointment, later assuming the title of general manager.

As vice-president of the McGraw-Hill Co., Inc., Mr. Britton is directing head of the industrial unit which consists of *American Machinist*, *Power* and the circulation department of the *Industrial Engineer*. He continues as general manager of the *American Machinist*.

November Exports Establish Year's Record

A new high record for the year in American exports was established during the month of November just passed, according to official overseas trade statistics made public today by Director Klein of the Bureau of Foreign and Domestic Commerce of the Department of Commerce.

Returns from Customs Districts all over the United States received in the Department of Commerce show that American agriculture and industry benefited from export business totaling $383,000,000 during November. This sum is about $90,000,000 higher than the value of shipments during November, 1921. It is $12,000,000 greater than October, which was the best previous month for the present year.

Engineers Plan Reception to Italy's Envoy

American engineers are planning a big reception to Prince Gelasio Gaetani, Italian Ambassador to Washington, now on his way to this country. A dinner, at which engineers from all parts of the country will be present, will be given in honor of the new diplomat, himself an engineer, by the American Engineering Council of the Federated American Engineering Societies, in Washington, on the evening of January 12, it is announced by L. W. Wallace, executive secretary of the federation.

The dinner will be the concluding event of the two-day annual meeting of the council, which will consider problems of national interest, including the report of the committee on work periods in continuous industries, which has reported in favor of the eight-hour day.

New England Engineers Hold Meetings

Engineering and technical associations in Western New England are enjoying a season of activity. At a joint meeting of the Engineering Society of Western Massachusetts and the Western Massachusetts section of the A.S.M.E., in Springfield, Mass., Dec. 19. Calvin W. Rice, national secretary, gave an account of the work of engineering societies in South America and the part they play in developing that continent.

H. H. Dewey of the General Electric Co., Schenectady, N. Y., addressed the Springfield section of the A. I. of E. E., Dec. 15, on "Recent Developments in the Design of Transmission Systems," dealing especially with problems of long-distance transmission in the desert and mountain regions of the West.

At a meeting of the Springfield Employment Managers' Association, Dec. 14, C. M. Ripley of Schenectady gave an account of the corporate organization and distribution of income of the General Electric Co., with a discussion of factors entering into efficient public utility service.

At a meeting of the Springfield chapter of the American Society for Steel Treating Ernest E. Thum, associate editor of Chemical and Metallurgical Engineering, addressed the members on educational policies relative to the laying of a ground work for a technical career.

A Bullard Bond Issue

The Bullard Machine Tool Co., Bridgeport, Conn., has issued $1,500,000 in 6½ per cent first mortgage bonds through S. W. Straus & Co. These bonds constitute a closed first mortgage on the land, building and equipment owned and to be acquired. These are coupon bonds, payable June 15 and December 15, maturing in from two to fifteen years.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Director, *Commerce and Finance*, New York

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IF UNIVERSAL recognition of its financial strength and economic predominance can make a nation happy then indeed this ought to be a happy Christmas for the people of the United States.

The world today waits upon America's decision with regard to the German loan, and the tone and tendency of the markets reflect the belief of the moment in the success or failure of the negotiations. Authentic interviews with Mr. Morgan and his partners make it clear that no loan can be placed here until France has agreed to reparations that are within Germany's ability to pay.

The French have not yet shown any willingness to abate their claims, but there is nevertheless an underlying feeling of confidence that the compulsion of events will somehow bring about an arrangement that will make it possible for Germany to borrow. The fact that enormous profits might be made directly and indirectly by those who had to do with the transaction has helped to strengthen the belief in its ultimate and early consummation. To this belief the steadiness and upward tendency of the markets last week was due and from now on the prospects of a loan will be a major influence upon sentiment here and abroad.

It is obviously impossible to speak with certainty as to the outcome, but if one had to make a guess it would seem wisest to assume that a credit so necessary would somehow be provided. As to the assertions of some that if such a credit is granted it will never be repaid it may be answered that the three greatest commercial nations, England, the United States and Germany, have more than doubled their aggregate population and quintupled their national income in the last fifty years, and that he who would measure the world's earning power in 1972 by present standards is a poor student of history.

Of the effect that the proposed loan would have upon American business it is possible to speak more definitely. There is hardly a doubt that it would work an instant increase in the export demand for our surplus production and a revival of industrial and commercial activity all over the world.

Our present national income is estimated at 65 billion dollars annually. If the effect of the loan should be to increase it by only 10 per cent, a minimum estimate, we should have recovered within a year four times the billion and a half that Germany seeks to borrow, and could well afford to charge our share to profit and loss.

In this larger view the economic logic of the loan seems to justify the assumption that it will be arranged. If not it is to be feared that Germany will be plunged into a condition of economic chaos from which she will emerge only through political revolution.

Encouraged perhaps by the hope that Europe will soon be put on an even keel the tone of domestic business has become a little more optimistic. The failure of a well known firm of stockbrokers in Kansas City had only a passing effect. On the Stock Exchange quotations are higher and the new bond issues offered have been readily absorbed. The rush to declare stock dividends continues but the tax selling is about completed and the recipients of the newly issued shares seem willing to keep them for the present. The Great Northern Railroad has reduced its dividend to a 5 per cent basis, but this reduction has been offset by an increase in the Michigan Central rate.

The car loadings are the largest on record but the congestion of traffic is unrelieved and business suffers accordingly.

The anomaly of the railroad situation is emphasized by an application from the Receivers of the Chicago, Peoria & St. Louis R. R. for permission to abandon that line in its entirety because it cannot earn enough to pay taxes. The road is 237 miles in length and serves a considerable population. If it had been part of a large system it might have been made to pay and the announcement that the Cleveland syndicate headed by the Van Sweringens has added the Chesapeake & Ohio to its recently formed trunk line system shows that the necessity of consolidation as a condition of survival is becoming more widely recognized.

An increase of 6 per cent in wages has been allowed to the 50,000 members of the Iron Moulders Union and other increases in other trades are expected shortly. Reports from the iron and steel industry are optimistic, with the mills running at 85 per cent of capacity.

The creation of another important unit in the steel industry has been effected through the purchase of the Brier Hill Steel Co. by the Youngstown Sheet and Tube Co. The formation of the Columbia Steel Corporation is also reported from San Francisco. It is a consolidation of the Columbia Steel Co. and the Utah Coal and Coke Co.

At 14¾ cents copper is at last well on its way upward. The advance is attributed to the reported but unconfirmed purchase of one large producing concern by another. There is, however, good reason to credit the report, for the spirit of consolidation seems to be in the air and the deal by which the Armour Company is to take over Morris & Co. is said to have been consummated with the Government's tacit approval.

Cotton, wheat, corn, rubber, sugar and coffee have all been steady with an upward tendency due to the hope that the German loan will be arranged, but restrained by Mr. Morgan's disavowal of any agreement to which his firm was a party.

The weekly statement of the Federal Reserve System shows a decrease of $15,000,000 in gold and an increase of $74,000,000 in circulation, both probably due to the holiday demand for gold and pocket money. As a result the reserve ratio has fallen to 72.8 per cent as against 75.1 last week. It ought to rise again in January. If not, higher rates for money would be natural, but thus far there has been no change and the best commercial paper can still be sold at 4½ per cent.

General trade is good but not abnormally active. The Christmas shopping which was begun early is now finished and the business world awaits the commencement of the New Year with confidence but without the expectation of a boom.

In its annual report the Bank of Montreal is optimistic as to conditions in Canada and a definite improvement in Cuba is expected when the $50,000,000 loan that is being arranged for shall have been placed.

Our exports for the month of November were valued at $383,000,000, which is larger than for any previous month this year. This is both surprising and encouraging but how we have been or will be paid for these exports is still a mystery.

Further Progress in Production

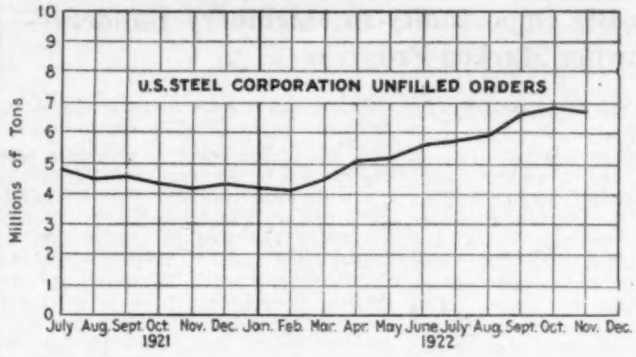
Continued advances in production, transportation and distribution in November are noted in figures compiled by the Department of Commerce in its "Survey of Current Business." The largest consumption of cotton since 1917, and further high records since 1920 in the output of pig iron, steel ingots, zinc, coke, locomotives, and upper leather emphasize the sustained and basic character of industrial production in November. The usual seasonal decline in building contracts in November failed to materialize.

The car shortage on the railroads was slightly relieved, but coal cars were still in great demand and coal loadings have been kept up to the maximum; total loadings of all classes were very high for November. Increased orders were made for locomotives and freight cars to overcome present congestion.

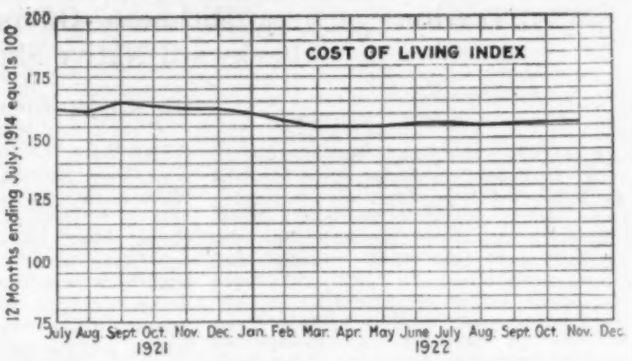
Price levels continued to increase in November, with both the total wholesale and the retail food indices the highest since the end of 1921. The relative purchasing power of farm products was considerably improved in November and this is reflected in the largest mail-order house sales since March, 1920.

The final crop reports for the year 1922 indicate a large production of the principal crops, especially wheat, potatoes, corn and rye, and should make for increased prosperity in the farming sections.

Unfilled orders of U. S. Steel Corporation based on the monthly reports showing the forward tonnage on the books at the end of each month.



Index of the Cost of Living based on weighted retail prices collected monthly and compiled by the National Industrial Conference Board.



UNFILLED ORDERS on the books of the U. S. Steel Corporation on Nov. 30, 1922, totaled 6,840,242 tons as compared with 6,902,287 tons on Nov. 31. The tonnage on order at the close of November, although 62,045 tons below the month previous, is greater than for any month since February, 1921, at which time unfilled orders totaled 6,933,867 tons. Beginning with March of the currrent year, an increase has been shown in each thirty-day period ranging from 140,-630 tons in July to as high as 741,502 tons during September. Railroad requirements and building construction demands continue as the chief features of the increase.

Metal product shares in the New York stock market declined during November, the average price of ten representative issues dropping to $77.50 per share as against $79.50 in the month previous. The decline is without special significance, the entire market having receded from the high point reached during September due chiefly to a lack of general public interest. The electrical equipment companies report a large volume of business on order.

Railroad rolling stock continued to attract attention during November, chiefly on account of the car shortage which began to be acute in October. With 179,239 cars short of requirements on American roads on Oct. 31, the increase has continued, although not so acutely, the shortage on Dec. 1, standing at 143,279 cars. The average for the month was 150,787 cars as against the October average of approximately 160,000 cars. Car surplusage changed slightly, the average being 5,735 as against 4,475 in the month previous. Cars in bad order decreased from 249,960 or 11 per cent to 225,842 or 10.1 per cent. Loadings of coal and grain continue heavy.

Comparative Prices of Shop Supplies

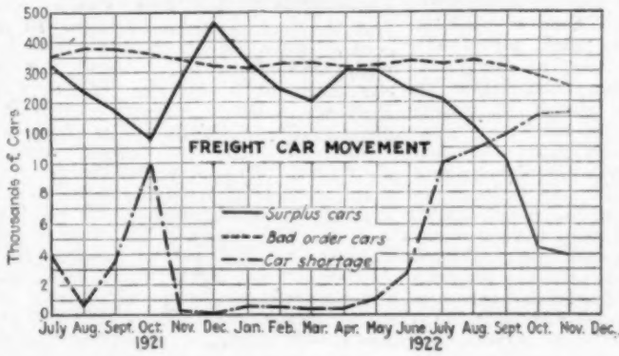
Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0295	$0.0295	$0.0273
Cold finished shafting	per lb	0.0378	0.0378	0.0373
Brass rods	per lb	0.171	0.1700	0.15
Solder (½ and ½)	per lb	0.24	0.23	0.20
Cotton waste	per lb.	0.11	0.11	0.122
Washers, cast iron (½ in.)	per 100 lb.	4.33	4.33	4.33
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.11	3.11	.....
Lard cutting oil	per gal.	0.59	0.575	.....
Machine oil	per gal.	0.36	0.36	.....
Belting, leather, medium	off list	30-10% @50%	40-5% @50%	
Machine bolts up to 1 x 30 in.	off list	55% @60%	50%@ 65-10%	50%@ 60-10%

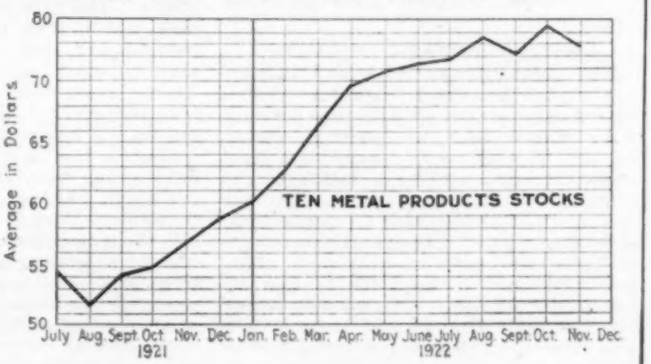
Cost of living among the families of wage earners in the United States on Nov. 15, was 58.4 per cent higher than in July, 1914, according to figures collected by the National Industrial Conference Board. Between Oct. 15 and Nov. 15 there was an increase of 1.3 points or one per cent. The changes in the budget within the month were continued slight increases in the average cost of food, clothing and coal. Between July, 1920, when the peak of the rise in the cost of living since 1914 was reached, and Nov., 1922, the cost of living dropped 46.1 points or 22.5 per cent.

American foreign trade for November shows a gain in exports of more than $12,000,-000 over the previous month, October shipments in turn being $57,000,000 greater than in September. The increase in November, as in the case of October, is due chiefly to raw cotton shipments, exports of this commodity alone being valued at more than $109,000,000, out of a total of $383,000,000. The November total shows an increase over the corresponding month of 1921 of approximately $90,000,000. Import figures are still unknown owing to the changes in the new tariff rates.

Monthly average of car shortage surplus and bad order cars in the United States based on returns to the car service division of the American Railway Association.



Monthly average: Ad. Rumely; Allis-Chalmers; American Can; Cont. Can; Gen. Elec.; Int. Harv.; Nat. Acme; Und. Type.; West. Elec. & Mfg. Co.; Worth. Pump.



The South African Machinery Market

Vast Territory of Great Richness—Offers Big Opportunity to Machinery Builders—Backward Native Showing Marked Progress

BY A LONDON CORRESPONDENT

AMERICAN manufacturers of electric equipment will be repaid by catering to the South African trade, because there is every indication that it is becoming one of the most important markets for these products. In 1921, overseas purchases amounted in value to approximately £2 millions against 1½ millions in 1920 and £1 million in 1913. During the past year there have been numerous installations of lighting plants in towns and villages, while the growing demand for power has compelled the local authorities at Cape town, Durban, Johannesburg, Pretoria, and other large centres to extend existing generating stations and to provide additional facilities. In spite of the general trade slump of the last two years the value of the trade has not declined, but has steadily risen.

There is every indication that this activity will be continued during the coming year. Reports from all the leading business towns point to the fact that stocks of fittings, etc., are very low, while it is generally agreed that orders for considerable amounts will have to be given out as soon as the power plants now on order have been installed. Both German and British firms are carefully watching the needs of the market. As German exporters are failing now to guarantee the date of delivery, while their prices show a tendency towards steady expansion, the principal rivalry will come from British firms. Other things being equal the feeling in South Africa is to place orders for electric plants with British houses, but there is a decided tendency on the part of the exceedingly important business in fittings, lamps, cooking and heating apparatus and general accessories to pass into the hands of foreign competitors. Tenders for the supply of generating plant are invariably advertised in the press in the usual way, but it is the local merchants who supply fittings, and it is very important, if business is to be obtained, that these dealers should be carefully canvassed both personally and by catalogs, together with the latest data respecting new lines and operations. Buyers in South Africa are particularly keen on new electrical devices and it will repay manufacturers to study them.

STRONG EUROPEAN COMPETITION

The latest information from this market is to the effect that the United States exporters of electric iron supplies have almost lost the trade in consequence of the cheap lines introduced from Germany and to a lesser extent from the United Kingdom. Formerly American makers had a monopoly in this direction. Whether German exporters can continue to supply these goods at such cheap rates is open to question, because her manufacturers are coming to the end of their tether, but even then British firms can underquote American prices. The average retail prices of a 5 lb. electric iron of American, British and German manufacture are, respectively, $9.50, £1 15s., and $7. Dealers in electric supplies report that more German irons are sold than of all others together, and that both wholesale and retail traders make a large profit on them. The agents of American firms in South Africa say that unless their home manufacturers can so pricee their irons that a retailer can sell a 5 lb. model for $8 or less the market may be entirely lost to American exporters.

IMPORTANCE OF NATIVE TRADE

The importance of the native trade in South Africa is generally overlooked by exporters. In South Africa and Rhodesia alone there are six million natives, as compared with a little more than 1½ million Europeans. The purchasing power of the native, present and future, is enormous. He is advancing in the scale of civilization, and his necessities are multiplying accordingly. The modern requirements of domestic life are every day more revealed. The plow and harrow are steadily superseding the pick and hoe and there is a good demand for the simpler kind of farm implements. The native population is increasing to a far greater extent, relatively, than the white population, and it can readily be imagined what the trade position will be in the near future. It should also be remembered that the total native population from the Cape to the Equator is estimated at over 40 millions.

It is very satisfactory to be able to record that the trade in agricultural implements throughout the South African Union is reviving. While many of the simpler types of implements have long been adopted on South African farms, there is wide scope for the sale of tools and machines embodying later improvements. Maize planters and one-horse cultivators, gang plows, lever harrows, mowers, rakes and maize shellers are among the implements in fairly general use; but on the other hand, adequate advertisement and demonstration should lead to the introduction of more up-to-date apparatus for planting and cultivating, including grain drills, disk harrows, ensilage cutters and many others. The type of plow in most common use is the two furrow walking mould-board, but the disk plows are also popular, especially in Rhodesia. There is considerable competition in this market for the supply of implements and agricultural machinery.

During the past ten years the disk harrow has been gradually superseding the tooth harrow. It was first introduced into the Transvaal and Natal, and there is believed to be a good opening for extending its sale in the Orange Free State and throughout the western parts of the Cape. The disk harrow is used in the cultivation of alfalfa, a very popular crop in South Africa, and it is credibly reported that a ready sale exists for other implements which are needed in connection with this crop.

As regards threshers, the demand is governed by the fact that this work is generally executed by contractors who travel from farm to farm, or in centers to which the small farmers cart their crops. Sometimes there is a sale for medium size threshers with 24 and 30 inch cylinders and straw chopper and bruiser attachments. There is also a demand for hand and power stationary threshers with 14 and 18 inch cylinders. In Rhodesia ground nut and sunflower seed threshers are also needed. There will probably be a larger demand for binders as more land is gradually bought under wheat cultivation.

The following table gives the value of the leading imports of machinery and implements into South Africa in 1921:

Kaffir hoes and picks	£28,578
Dairy utensils	57,114
Hay presses	7,810
Plows, harrows, and parts	439,093
Reaping and mowing machines	55,867
Tractors	45,897
Wine presses and pumps	2,036
Other implements and machinery	363,810

One of the best and most practical ways of pushing trade in this market is to exhibit freely at the best local farm shows. Districts affected by drought are good buyers of windmills, pumps, and piping.

TRACTOR PROSPECTS BRIGHT

With the return of better times the South African farmer will be a better purchaser of tractors. Among the points to be considered in this connection are the following: types of tractors suitable for certain soils, horse power relative to the altitude at which the tractor is employed, method of distribution, spare parts and "service." In Zululand plowing is made difficult by the roots of sugar cane remaining in the ground, and also by the lack of moisture. The soil in Natal and the Cape is fairly light and easy to work. On the other hand, the soil in the Transvaal and the Orange Free State becomes intensely hard and dry. As regards the internal combustion engine it should be stated that the loss of power at an altitude of 4,000 feet amounts to 10 per cent, and at 5,000 feet the loss is reckoned to be 20 per cent. These elevations are often met with throughout the country. Along the coast of Natal and in the Cape Province, power is slightly increased in consequence of the humidity of the air.

There is today an excellent opening throughout Rhodesia, for small mine plant as distinct from the large battery stamps, etc., purchased by the big companies. The market for mining machinery is at present worth about £60,000 a year, but when we remember the various mining developments now taking place, the value within the next five years might very well be trebled.

There are innumerable opportunities

in this market for the sale of electrical, industrial, mining, farming and other machinery. Rhodesia is one of the few countries that has emerged almost unaffected from the general commercial depression of 1921. Indeed, more manufactured goods were imported during that year than in the boom year of 1920.

Even quite small towns are actively considering the possibility of erecting power stations. Taken separately, these may be only small orders, but if viewed collectively they amount to a very respectable sum and become a source of business which no manufacturer can afford to despise. This specially applies to the suppliers of generating plant, electric cable and electric fittings. It is worth noting, also, that Rhodesia's trade in electrical machinery and material has risen in value from £44,000 in 1913 to £88,000 in 1921.

Round about the principal towns, such as Salisbury, there are springing up numerous factories for the production of furniture, soap, candles, metal goods, and many other articles. All this necessarily means a market for machinery and plant of various kinds. It is essential that catalogues should contain full data respecting the working of the machinery dealt with, the assembling of parts; capable local agents are necessary, while a high degree of standardization is necessary in most lines of farm implements. The market for cheap and light plows alone is worth £70,000 a year in Rhodesia.

The principal competition will come from British manufacturers. Until 1921 the Germans were almost a negligible quantity, the value of German imports into South Africa in that year amounting in value to only a trifle over £1,000,000. In the first six months of 1922 they amounted to £1,315,596 and there is every reason to believe that by the end of the year this latter amount will have doubled. These figures are very significant when we examine the general trend of South African trade. Compared with the first six months of 1921 the country's total imports decreased from £29,500,000 to £23,000,000; the imports from Great Britain declined from nearly £16,000,000 to nearly £13,000,000, and those from U. S. A. dropped from £5,500,000 to a little over £2,500,000. Yet the imports from Germany actually rose from £504,000 in the first half of 1921 to £1,315,596 in the corresponding period of 1922. German competition is especially severe in cutlery, enamelled ware, fencing wire, certain classes of machinery, farm implements, tools, etc.

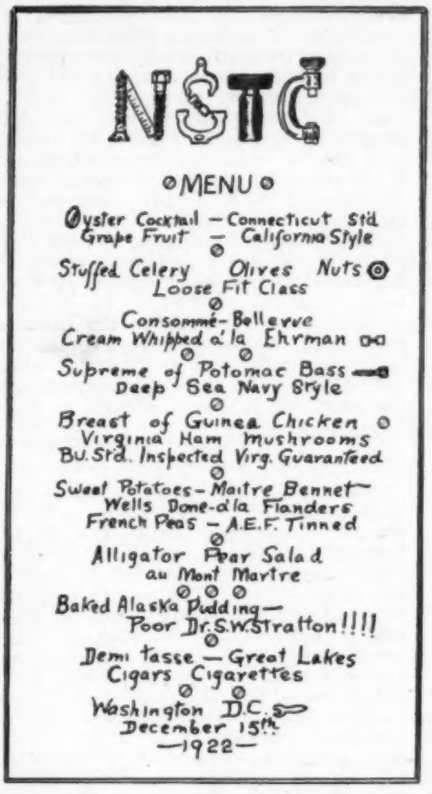
Railroad Rapidly Reducing Bad Order Engines

From Nov. 15 to Dec. 1, the railroads repaired and turned out of their shops 13,484 locomotives. This was within six locomotives of the greatest number repaired during any semi-monthly period in approximately the last two years, according to reports received today from the carriers by the Car Service Division of the American Railway Association. This also exceeded by 1,345 the number turned out of the shops during the first half of November this year.

Locomotives in need of repair on Dec. 1 last totaled 18,009 or 27.9 per cent of the number on line.

Screw Thread Commission Honors Stratton at Important Session

That the work of the National Screw Thread Commission is well advanced and is reaching the point where important recommendations will be made public, was revealed at a meeting of the Commission held in Washington on Dec. 15. Since this is the last meeting of the Commission at which Dr. S. W. Stratton, its chairman, will preside, the other members of the Commission gave a dinner in his honor. The menu, reproduced herewith, was decorated cleverly



with bolts, nuts, screws, gauges, and wrenches.

Col. E. C. Peck, of the Cleveland Twist Drill Co., was elected to serve as acting chairman of the Commission until a successor to Dr. Stratton will have qualified. The law creating the National Screw Thread Commission provides that the Director of the Bureau of Standards is to be chairman of the Commission. It happened that Col. Peck himself could not be present at this meeting because of the fact that he had to attend the annual dinner given by his company in Cleveland. All other members of the Commission were present.

The Commission is about ready to submit a list of recommended sizes for tap drills. These sizes were carefully considered by the Commission and a number of criticisms and suggestions offered.

F. O. Wells, one of the members of the Commission, submitted a report on recommended sizes and tolerances for bolt heads, nuts and wrenches. The tables of these dimensions were arrived at at a joint meeting of subcommittee number two of the American Engineering Standards Committee sectional committee. The dimensions cover regular hexagon and square-head nuts for both coarse and fine threads; hexagon head, cap screws, square-head cap screws and wrench openings. Tolerances are recommended for both bolt-heads, nuts and wrench openings.

A sub-committee headed by Major J. O. Johnson is doing preliminary work looking to the standardization of oil-well equipment, especially casing pipe and threaded joints. Major Johnson's committee will work in co-operation with the Standards Committee appointed by the American Petroleum Institute. A report is about completed on special threads for electric fixtures and fittings. This report is based on report No. 1,525 of the American Society of Mechanical Engineers, which was presented in December, 1915, and on a report made on Nov. 19, 1921 by the National Council of Electric Fixture Manufacturers. These reports are being co-ordinated and the screw thread commission is supplementing them in certain particulars. As soon as the report is completed it will be sent out to those interested for suggestions.

The Commission voted to renumber classes of fit so that the fits will be as follows:

NEW

Class 1	Loose fit
Class 2	Full fit
Class 3	Medium fit
Class 4	Close fit
Class 5	Wrench

PROGRESS REPORT

Class I	Loose fit
Class II-A	Medium regular
Class II-B	Medium special
Class III	Close fit
Class IV	Wrench

It was decided to take advantage of the simpler form of consecutive Arabic numbering rather than the use of Roman figures as had been done in the progress report previously submitted.

National Foreign Trade Council

The Tenth National Foreign Trade Convention of the National Foreign Trade Council will be held in New Orleans on April 25, 26, 27, 1923, according to announcement of O. K. Davis, Secretary of the Council.

"The selection of New Orleans as the Convention city," said Mr. Davis, "is peculiarly fitting in view of the development of the city as a great center of American foreign trading activity. In 1921 New Orleans was the second port of the United States, importing coffee, sisal, burlaps, bananas, crude oil, and sugar; and exporting corn, rice, wheat, cotton, glucose, steel rods not wire, iron pipes, steel plates and sheets, lard, cottonseed cake, meal and oil, mineral oils, tobacco and lumber.

"Of special interest to foreign traders in all parts of the Mississippi Valley has been the development of shipping facilities at the Port of New Orleans, and the consequent increase in steamship services. Since the Third National Foreign Trade Convention was held in New Orleans in 1916, this progress has been particularly marked, and has been accelerated by the increasing proportion of American foreign trade carried on with the West Indies, Central America, Mexico, South America and Asia, much of it passing through gulf ports.

Southern Iron Output Makes Record

Official figures on pig iron production in Alabama, the Southern Metal Trades Association advises, reached 208,934 tons in November, the largest month of the year, the largest in fact since the depression period set in more than two years ago. Production was almost 100 per cent larger than that of November, 1921, which was 108,121 tons. There were 22 stacks active in November, but since then others have been blown in and the end of December will find 25 stacks active, the largest number in almost three years. By mid-1923 it is believed all stacks will be running.

The Association also states that what is driving pig iron prices down in the Southeastern district at this time is largely the European competition, considerable tonnage of pig iron from across the water reaching the United States. Lately large tonnages of European made pig iron have been sold to metal trades consumers in the South at prices less than southern makers are quoting.

With the blowing in of two additional furnaces by the Tennessee Coal, Iron and Railroad Co. before the end of December, this company will have eleven furnaces on the active list, and production will be close to capacity in the Birmingham district again. The Southern Metal Trades Association advises that while exact tonnages are not known as yet there have lately been unusually good sales of pig iron, estimating the tonnage at between 150,000 and 200,000 tons. The nominal price level is $23 still, but many sales are reported to have been made under this base, some as low as $21. The pig iron melt will continue well into 1923 according to present indications on a big scale, with the year probably proving one of the biggest in history.

The Southern Metal Trades Association has announced that reductions in freight rates on pig iron from Alabama and Tennessee producing points to Central Freight Association territory, in the opinion of the Interstate Commerce Commission, would discriminate against producers of pig iron in southern Ohio and St. Louis. In the decision of the Commission, therefore, southern railroads have been ordered to maintain the present rates that are in effect, and to cancel all scheduled granting reductions which were suspended on Sept. 1, at which time they werer to have gone into effect.

Car Shortage Shows Decrease

From December 1 to December 8, there was a decrease of 21,825 in the freight car shortage, according to reports received today by the Car Service Division of the American Railway Association from the railroads of the country. The total shortage on December 8 amounted to 111,961 cars.

Shortage in box cars totaled 56,711, a decrease of 10,757 within the same period, while the shortage in coal cars totaled 37,613 or 5,235 below that on December 1.

Reports also showed a gradual increase in the number of surplus freight cars in good repair scattered throughout the country, the total on December 8 being 6,657, which was a gain in approximately a week of 1,062 cars.

The Oakite Sales Conference

The Sixth Annual Sales Conference of the Oakley Chemical Company, New York, manufacturer of Oakite, from Dec. 18 to 21 inclusive, was attended by all but two of its 66 sales representatives. A very interesting feature was the one minute speeches of the first day when every man told of business conditions in his territory. The significant thing was that, without exception, the men reported better business in all lines reached by them and further, that this was in spite of extreme caution in buying. This evidently means that manufacturers have been warned by the prediction of economists regarding a premature false boom, and have effectually prevented it.

Six selling papers occupied the first afternoon session, these being: Essentials of Successfully Selling our Materials, F. A. Aston; Service an Important Factor in Selling Oakite Products, G. M. Barnes; Meeting Unusual Sales Resistance, D. X. Clarin; Advantages of Systematic Planning and Selling, C. A. Ormsby; Developing a New Territory, P. A. Boeck and Impressions of a First Year Oakite Salesman, H. Kennedy.

These conventions have the unusual method of beginning with a breakfast and keeping the men well together during the day. In this way the men get the most out of the meetings.

Technical Papers on Important Topics Presented

The second and third day's papers were technical: Carpet Cleaning, N. W. Halsey; Locomotive Parts, C. Burgin; Territory Laboratories, F. J. Fayen; Field Service Reports, H. J. Butler; Investigation vs. Taking Things for Granted, O. W. Hoster; and Oil Barrels and Drums, J. F. Ewing. This was followed by a second technical session with the nine papers listed, after which there was a dinner and theatre party. The nine papers were: Washing Artificial Silk, G. W. Miller; Kierboiling Cotton Yarn before Mercerizing, A. W. Quinn; Finishing Cotton Knit Goods, H. M. Upson; Some Peculiar Facts in Cleaning, L. B. Johnson; Packing Plant (hog scalding), C. E. Barber; Packing Plants (chiefly outside of hog scalding), O. A. Fiss; Oakite in Chesse Factories and Condensed Milk Plants, F. J. Wall; Oakite in Paper Mills (felts and vitriol on new felts), L. C. Minor, and Comparison of Work in Institutional and Steam Laundries, M. L. Shorey

The third day covered three more technical papers: Oakite in Steel Mills, H. L. Trembicki; Cleaning Auto Bodies before Painting, E. Lacy; and Spraying Oakite Solutions, V. Frazee, followed by laboratory demonstrations.

A unique feature was the awarding of prizes at the banquet, for the best results in the November sales drive. This drive was fashioned after the wild and wooly west, cowboys and all. The salesmen had cowboy names and belonged to typically named ranches. Each man had a certain quota, based on his opportunity and previous record. A point was called a steer and every man who roped 110 steers or over, won a suitably inscribed fountain pen.

Of the 56 men who were actually in the field during the drive, 38 won prizes at the final "round-up," making a remarkably uniform showing for the "cow punchers."

Railroad Tonnage Shows Gain Over 1921

In the quarter ended with September, according to a summary of freight commodity statistics, made public by the Interstate Commerce Commission last week, tonnage hauled by the big or Class 1 railroads of the country was 5.89 per cent greater than in the corresponding quarter of the preceding year. The tonnage was 467,900,164, compared with 441,880,704 in the same months last year.

The increase took place notwithstanding the quarter was composed of the months in which the railroad shopmen's strike became effective, and embraced the months in which the strike of the coal miners was the most virulent. The loss in coal tonnage was only 2.35 per cent. Coal and agricultural products alone showed smaller tonnages than in the corresponding quarter of last year.

Grinding Association Elects Officers

Theodore A. Meyer recently was elected president of the Central Cylinder Grinding Association in Indianapolis. Other officers are as follows: vice-president, W. W. Adams, Fort Wayne; secretary, J. T. Andrews, Indianapolis; treasurer, George W. Kemp, Muncie; board of directors Val H. Lindenschmidt, Evansville; H. B. Shank, Fort Wayne, and V. J. Thampher, Connersville.

Growing Interest in Export Trade

The increased desire of American firms to enter foreign markets with their wares is reflected by a 400 per cent gain in foreign trade inquiries directed to the Department of Commerce this year, as compared with last, Director Julius Klein, of the Bureau of Foreign and Domestic Commerce, declares in his annual report.

Describing the fiscal year 1921-22 as "one of the most crucial periods in the history of the nation's foreign trade," Director Klein points to the complete reorganization of his bureau under Secretary Hoover's direction as the prime factor enabling it to help American export interests withstand the "inroads of recovering European competition in the world's markets."

Following out the policy of "better service with less meddling," Director Klein says that the Bureau of Foreign and Domestic Commerce now serves business on a commodity basis through seventeen new divisions which specialize on America's great export products of the factories and farms.

In concluding his report, Dr. Klein states that if the bureau is to carry on and enlarge its work in the manner dictated by the economic situation of the country, its activities should be extended to cover the study and promotion of domestic commerce. Its foreign service should be strengthened by the establishment of offices in new markets. Experts in commodities not yet specifically provided for, such as tobacco, grain and many manufactured specialties, should be added to its present staff to meet the increasing demands of the trades.

Numbering of Steels to Be Developed by A.E.S.C.

A system of designating kinds or qualities of steels by code numbers, each of which would represent a definite specification, will be developed as a result of the decision of a conference of the principal producers and users of steel held at Washington, D. C., December 6, at the call of the American Engineering Standards Committee. The conference recommended that this code be developed under the procedure of the A.E.S.C. and suggested to that organization the appointment of the Society of Automotive Engineers and the American Society for Testing Materials as joint sponsors for the code.

The agreement to go ahead with this project was arrived at after a spirited discussion concerning the necessity for and practicability of a numbering system. Strong opinions in favor of the designation of steels by number were voiced by heavy buying interests, such as the U. S. Navy Department, the Electrical Manufacturers' Council, the Society of Naval Architects and Marine Engineers, the U. S. War Department and the Federal Specifications Board. It was pointed out during this discussion that shipbuilders use every conceivable variety of steel opposition to the inclusion of tool steel was voiced by tool steel makers. As against the claim that the numbering of steel is not desirable so far as tool steel is concerned, it was brought out by a representative of the Navy Department that the Navy now has an accumulation of a million pounds of unidentified tool steel, all of which must be analyzed and tested before it can be used. This condition, it was said, would not exist if the quality of steel were designated by code numbers, representing definite specifications, rather than by the general terms, trade names, or brands now in common use, or—in some cases—by no mark at all.

Purchase on Chemical Analysis Makes Numbering Desirable

The arguments used against the numbering of tool steels, Admiral Cone declared, were identical with the arguments used 25 years ago against the writing of specifications for steel of any kind. As an indication of the feasibility of a uniform system of designating steel, it was asserted that almost 90 per cent of the steel used by the automotive industries is purchased on the basis of chemical analysis.

The conference voted that it is desirable to have a uniform numbering system, based on specifications, for forging steels, casting steels, structural steels including plates, tool steels, and other steels, this decision with the exception of tool steels, being taken without dissent. Whether the basis for such a numbering system should be chemical composition, physical properties, or heat treatment was left to be determined by a Sectional Committee, which is to be approved by the American Engineering Standards Committee. It was also left to the Sectional Committee to decide whether there are any existing systems which can be used as a basis for numbering codes for any or all of the various groups of steels. The question of whether brand names can be accommodated to and associated with a numbering system was brought up, but the consensus of opinion was that this is not practicable.

The conference was opened by a résumé of present American practice in designating steels, by Dr. G. K. Burgess, Chief of the Division of Metallurgy of the U. S. Bureau of Standards, and a résumé of European practice by L. H. Fry, representing the American Society for Testing Materials. Mr. Fry said that Switzerland and Germany have already taken definite steps toward a numbering system. The method proposed in Switzerland provides a system of symbols intended to be universal and definite, and capable of expansion to suit new requirements. In France a method is offered by which steels will be numbered with relation to a definite specification for the type, augmented by a letter indicating the method of manufacture, and a number showing the minimum tensile strength. In Great Britain a numbering system is employed for aircraft steels, and a tendency is appearing to develop symbols for automobile steels. Some limited symbolization is used in Holland also. Mr. Frey's full report based on information obtained from abroad by the A.E.S.C. will be sent upon request to the American Engineering Standards Committee.

Sees Budget System in Danger of Attack

Dangerous attacks on the Budget system were foreseen by John T. Pratt, chairman of the National Budget Committee, in an address before the Four Founder Societies of civil, mining, mechanical and electrical engineers at the Engineering Societies' Building, 29 West 39th Street, Wednesday night, Dec. 13.

Jealousies, he warned, would arise in federal bureaus, and perhaps in the Cabinet, from reductions in estimables, though these reductions were insisted upon by President Harding. Mr. Pratt asserted that the people of this country must be split into two main parties with clear-cut differences of opinion on national issues.

"For the fiscal year 1923-1924 the actual Budget estimates on the convening of Congress this month indicated a very small, or no, deficit," said Mr. Pratt. "All these figures and estimates take into calculation no extraordinary expenditures authorized by Congress, such as the soldiers' bonus, the ship subsidy, or other like bills calling for large expenditures of money.

"The dangerous attacks on the Budget system are likely to come from the very large reduction of some $600,000,000 made by General Lord, at the instance of the President, in the tentative figures of the Departments for 1923-1924, which were that amount larger than the actual figures submitted by the President in his message to Congress. No such cut can be made in the tentative estimates without arousing jealousies and dissatisfaction on the part of many of the bureau chiefs, and possibly some of the Cabinet officers."

The tendency of the times, according to Mr. Pratt, seems to be one of dissatisfaction with national legislation. The people feel, he said, that they are not getting full, complete and immediate action from their representatives in Congress in accordance with their ideas. He added:

"The people seem to be reaching out for a pure democracy, forgetting to realize that there is a very distinct difference between a republic and a pure democracy. The setting up of the Constitution indicates it was the first clear check against the historical development of democracies and established the principle of a republican form of government.

"The Budget Act is another similar check to the tendency to establish a free democracy, instead of the republic form of government, in this country. I refer to the republican or constitutional form of government, as opposed to the tendency shown by the attempts of the La Follette group for extension of the direct primary system and for modifications in the Constitution which would permit of a more immediate expression of popular will by shortening the time between the election of representatives and the convening of Congress."

Mr. Pratt declared that the National Budget Committee would constantly try to create public consciousness in favor of preserving the integrity of the Budget Act of 1921. Other aims, he said, were reorganization on functional lines of the executive department of the government, and co-ordination between the executive and the legislative branches by having Cabinet members appear on the floor of the House and Senate in defense of their Budget estimates.

Further Decline in Structural Steel Sales

A considerable seasonal decline occurred in the sales of fabricated structural steel in November, according to reports received by the Department of Commerce through the Bureau of the Census. November sales amounted to 46.8 per cent of shop capacity as against 57.3 per cent reported for October.

These percentages are based on a uniform capacity rating recently reported to the Bureau of the Census by almost all the reporting fabricators. Through these new ratings, the total monthly capacity of the 140 identical firms reporting each month from April through November has been reduced from 223,685 tons to 211,510 tons. The following table shows the tonnage booked each month by these firms and the percentage of their revised capacity:

	Tonnage Booked	Per Cent of Capacity
April	193,520	91.5
May	173,588	82.1
June	154,770	73.2
July	143,907	68.0
August	146,621	69.3
September	137,485	65.0
October	121,150	57.3
November	99,049	46.8

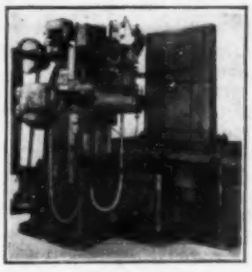
On the basis of these revised capacity reports and of known or reliably estimated capacities of other concerns, the Department of Commerce places the present capacity of the fabricated structural steel shops at 250,000 tons per month.

A considerable increase in the capacity of the structural steel fabricating shops of the United States since 1913 is shown in a special survey made by the Department of Commerce. A preliminary report, based on data received from 143 firms with a total revised capacity rating of 208,440 tons per month, shows an increase since 1913 of 45,025 tons in monthly capacity, or about 22 per cent.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Die-Sinking Machine, Automatic, Type F
Keller Mechanical Engraving Co., Brooklyn, N. Y.
"American Machinist," November 9, 1922

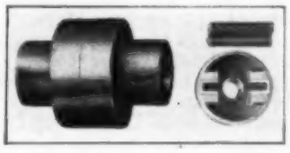


The machine is intended for work in which impressions up to 36 x 20 in. and 8 in. in depth must be made. The work table has horizontal feeding movement as well as quick-return movement. The vertical and the in-and-out or transverse movements are in the head. There is also a contouring movement. The control of all movements is electrical, for both the automatic feed and the hand control by pushbuttons. Two separate motors are provided, one a variable-speed of ⅜ hp. for controlling the various movements, and the other a 2 hp. d.c. motor connected directly to the lower cone-pulley shaft on the rear. Table: horizontal travel, 36 in.; feed, from 1½ to 12 in. per minute. Range of speed, from 80 to 3,636 r.p.m. Floor space, 9 ft. x 5 ft. 1 inch.

Projector, Contour Measuring
Bausch & Lomb Optical Co., Rochester, N. Y.
"American Machinist," November 9, 1922

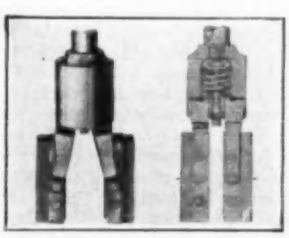
The projector is for inspecting gages, threaded work, gears, form cutters and all sorts of small parts for contour, and after heat-treating for checking to detect distortion. A dark room is not required for operation, as the image is produced on the horizontal table draped with a curtain. The work carrier is a compound slide given three movements by screws with handwheels, the vertical and the lateral movement to position the work, and the third movement to focus the image on the screen. The work may be held between centers or supported by adjustable V-blocks. The adjustable thread chart, lead measuring device, screw holder, gear attachment, two opaque attachments, photographic plate holder, and angle plate can be furnished for attachment to the instrument.

Shaft Coupling, Flexible, "Tilting-Bar"
American Foundry & Manufacturing Co., Frederick, Md.
"American Machinist," November 9, 1922



The coupling consists of only three parts, two flanged hubs with sockets in their faces and a steel bar that fits into the sockets. Flexibility is obtained by tilting and sliding the bar in its sockets, so that parallel, angular and end-wise misalignment of the two shaft ends can be accommodated. Except for very slow-speed drive, the sockets are bushed with leather to furnish electrial insulation and give quiet operation. The two hubs of the coupling tend to move toward each other. The coupling is ordinarily fastened to the shaft by means of one setscrew on top of the key and another at right angles to it. Standard sizes, for shafts ¾ to 6½ in. in diameter. Weight: smallest size, 3 lb.; largest, 1,080 pounds.

Tool, Cylinder Finishing, Stoning
Storm Manufacturing Co., 406 Sixth Ave. South, Minneapolis, Minn.
"American Machinist," November 9, 1922

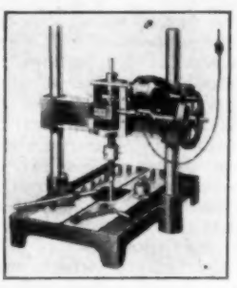


The tool is for finishing the bores of automotive cylinders by polishing or burnishing action after the cylinders have been reamed, rebored or reground. It may be driven by an ordinary drilling machine or by a special driving mechanism furnished. Two abrasive stones of fine texture are carried and rub against the bore when the tool is revolved. They are held in contact with the cylinder wall by the action of the spring in the center of the body, adjusted by the arbor. The spring is usually compressed to about 110 lb. pressure, which is transmitted from the lower disk to the cams on the arms holding the stones. When the tool is off center, all the pressure is transferred to one cam, so that only one stone bears against the work. The action thus tends to center the tool.

Drilling Machine, Sensitive, Ball-Bearing, High-Speed
Sigourney Tool Co., Hartford, Conn.
"American Machinist," November 9, 1922

The machines are of both the column and floor types and have single, two, three and four-spindle heads. The spindles are enclosed by telescopic sleeves and their projecting upper ends also are enclosed in stationary removable sleeves. The heads are adjustable vertically upon the face of the brackets for 6 in. The vertical movement of the spindle by rack and pinion is 2⅜ in. and the moving parts are counter-balanced by concealed springs. A clamp is provided for fine adjustments on each head. Table: Vertical movement on column, 30 in.; dimensions, 9½ x 12½, 12 x 25, 12 x 31 and 12 x 37 in. for one, two, three and four-spindle machines. Weights, 400, 625, 765, and 960 lb., respectively.

Boring Machine, (Re-), Cylinder, "Superior"
Production Machinery Co., Jackson, Mich.
"American Machinist," November 9, 1922

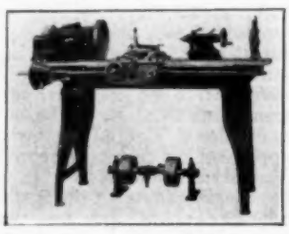


The machine will handle any automobile motor cylinder, and consists of a bed-plate to which the cylinder is clamped, and a cross-rail which carries the working parts. The boring bar is held between two centers. The cutter contains six blades adjusted simultaneously by a handwheel. The machine is furnished complete with two cutter heads, giving a range of from 2⅛ to 4¼ in. Four feeds are available by changing the position of the rollers with which the star wheel comes in contact. The machine can be furnished with a ¼-hp. electric motor, or with pulleys for belt drive.

Grinding Machine, Cylinder, Vertical, Williams
Hy-Way Service Co., 225 South St. Joseph St., South Bend, Ind.
"American Machinist," November 9, 1922

In this machine the work lies on the horizontal table with the cylinders vertical. All the driving mechanism is located above the grinding wheel. Longitudinal and transverse screws operated from the front, locate the work table. The entire mechanism for driving the wheel is mounted on the wheelhead, which slides on the vertical column. The 2-hp. motor rotates the grinding spindle at high speed, revolves at low speed the eccentric sleeves carrying the spindle, feeds the head downward, and returns it to the starting position. The eccentricity of the spindle from the center of the spindle unit may be varied from 0 to 1¼ in. Holes as small as 2¾ in. in diameter can be ground to a 17 in. depth. Floor space, 37 x 42 in. Weight, 4,000 pounds.

Lathes, Engine, 10-, 12- and 14-Inch
Oliver Machinery Co., Grand Rapids, Mich.
"American Machinist," November 9, 1922



The lathe is made in both cone-pulley and geared-head, single-pulley types. Straight or gap bed, bench or floor legs, oil pan and pump, and countershaft or motor drive can be furnished. Six speeds from 25 to 500 r.p.m. are provided with the cone-pulley headstock. With the geared headstock six speeds, ranging from 32 to 500 r.p.m., are obtainable by shifting two levers. A friction clutch is fitted in the driving pulley. The range of feeds with the change-gear is from 0.0025 to 0.039 in. for all sizes of the machine, and all standard threads from 3 to 40 per inch can be cut. Standard bed lengths, 4 ft. 3 in., 5 ft. 3 in., and 6 ft. Carriage cross-slide travel, 6¾, 7¼ and 8 in., respectively. Weights, 575, 875 and 1,300 pounds.

Clip, paste on 3 x 5-in. cards and file as desired

Urges Exporters to Help Europe

The only satisfactory way that we can revive foreign trade and aid the American exporter, the American farmer and American business in general is in the finding of ways and means to co-operate effectively with Europe in bringing about in Europe sound money and sound public finance, and, as a consequence, a revival of European industry and European exports, Dr. Benjamin M. Anderson, economist of the Chase National Bank, declared last week, in addressing a luncheon meeting of the American Manufacturers' Export Association at the Hotel Astor, New York City.

Dr. Anderson's subject was, "What Is Happening to Our Foreign Trade?" If the economic life of the world were functioning normally, said Dr. Anderson, we should have an "unfavorable balance of trade," or an import surplus, instead of our present favorable balance of trade, or export surplus. He added that this favorable "balance of trade," which many were afraid would disappear if European trade revived, was a mere bogey.

"The fear is an idle one," said Dr. Anderson. "We have done without comforts and luxuries long enough. Moreover the American market for the products of American industry will not be diminished by the process. Europe will not merely send us goods, but will also provide us with funds with which to pay for them. If goods are sent from France to the United States and sold here, and if at the same time the French Government is making remittances to the United States Government in payment of debts, the French Government will purchase with francs from the French shipper of the goods the dollar credits in New York which have been caused by the shipment of the goods, and will turn these dollar credits over to the United States Treasury.

"The United States receiving dollars from the source, will need to impose less heavy taxation upon the American people, and the American people will have consequently an increased volume of spending power, adequate to take care, not merely of the products of their own industry, but also of the French goods as well.

Business Items

The Terrell Machine Co., of Charlotte, N. C., has amended its charter increasing the capital stock to $100,000 from $25,000, it has been announced by E. A. Terrell, head of the company, the additional capital to be used for expansion purposes during 1923.

The Chapman Valve Manufacturing Co., Springfield, Mass., has declared a stock dividend of 50 per cent, transferring $500,000 from surplus to capital stock. Stockholders of record Dec. 19 will receive three shares for every two previously held by them.

The National Tool Co., Cleveland, Ohio, has acquired the manufacturing rights of the Simmons Method-Hob Co. of 2nd St. and Duncannon Ave., Olney, Philadelphia, Pa.

The Turner & Seymour Manufacturing Co., producers of high quality drapery and upholstery hardware, chain, etc., located at Torrington, Conn., has been purchased by W. R. Bassick, H. L. Sutton, and Willard L. Case.

The Birmingham Iron Foundry, Derby, Conn., manufacturers of rubber mill and rolling mill machinery, has recently increased its capital stock from $300,000 to $1,200,000.

The Fales & Jenks Machine Company, manufacturers of cotton machinery, Pawtucket, R. I., has recently increased its authorized capital stock from $400,000 to $2,000,000.

The Rowbottom Machine Co., manufacturers of automatic machinery, Waterbury, Conn., has increased its capital stock from $10,000 to $100,000, filing a certificate to that effect with the Secretary of the State of Connecticut, during the present week.

The Universal Valve Co., of New Britain, Conn., recently incorporated, elected the following officers during the past week: George LeWitt, president and treasurer; E. P. Burns, vice-president; and M. C. LeWitt, secretary.

The San Diego Supply Company has been incorporated at San Diego, Calif., to carry on the business of building contractor, with a capitalization of $100,000, of which $500 has been subscribed. The incorporators are: Gordon Gray, Union Bldg.; M. J. Irving, W. I. Ames, A. E. Rogers and F. F. Gray.

Sargent & Company, of New Haven, Conn., manufacturers of mechanics' tools, builders' hardware, etc., has voted an increase to its authorized capital stock from $325,000 to $6,500,000.

The Bennett Metal Treating Company, with plant in Elmwood, West Hartford, Conn., has recently incorporated under the laws of Connecticut, with a capital stock of $50,000, to engage in the metal treating business. The firm will begin business with $30,000, and the incorporators are: A. J. Davis, Alvan L. Davis, and H. R. Barker.

The Brown & Sharpe Manufacturing Co., machinery and tool manufacturers, Providence, R. I., during the past week voted a 16,000 per cent stock dividend on their capital stock, thereby increasing it from $100,000 to $16,000,000. This is one of the largest increases in capital stock in the New England States for some time, and while the Brown and Sharpe Co. has always been one of the biggest industries in the East, the capital stock was kept at $100,000. The firm was incorporated in 1868, and employs about 5,000.

The Gilbert & Bennett Manufacturing Co., Georgetown, Conn., manufacturers of wire goods, netting, etc., has increased its capital stock from $2,000,000 to $2,500,000, at a recent meeting of the directors.

Mobile Pulley and Machine Works, formed recently, now has its new Mobile plant in operation producing steel from an electric furnace. This is the first steel producing company in Mobile. A. J. Parsons is president of the concern.

The Southern Metal Trades Association, headquarters of which are in Atlanta, has been advised by the Lucey Manufacturing Co., of Chattanooga, one of its members, of the receipt of a large order for well drilling machinery from Soviet Russia.

The Alabama Manufacturers' Association, in annual convention at Birmingham in mid-December, reaffirmed its stand on the labor question, adopting resolutions strongly opposed to the closed shop and in favor of the American plan of operation in the Alabama industries. L. Sevier was elected president of the body for the ensuing year.

The Birmingham Stove and Range Co., operating a foundry and shops at Birmingham, Ala., is increasing its capital from $122,000 to $213,000 for the purpose of further expanding its business during 1923, according to Bolling H. Jones, of Atlanta, president of the company.

The Foster Machine Co., Westfield, Mass., dedicated its new two-story addition Dec. 14, when the officers of the company were hosts to the employees and their families at an evening party. Motors have been installed and also reflectors to provide an abundance of light. This addition will increase by one-third the company's production of textile and other machinery.

The Hart & Cooley Mfg. Co., at a meeting of the directors last week voted to recommand to the stockholders that a 50 per cent stock dividend be declared and the capital stock be increased from $660,000 to $990,000. The regular quarterly dividend of 3 per cent was declared.

The Southern Spring Bed Co., of Atlanta, is to immediately issue $250,000 in bonds to provide funds for greatly enlarging the capacity of the Atlanta plant, according to an announcement by Robert W. Schwab, president. Present floor space is about 70,000 square feet, and this will be increased to 125,000 square feet.

The Hurley Machine Co., New Haven, Conn., has declared a dividend of 10 per cent on the common stock, payable in common stock and the regular quarterly dividend of cents on the common stock, both payable Jan. 4 to stock of record Dec. 28.

The Westinghouse Electric and Manufacturing Co. has leased a six story building to be erected on a lot 100 x 150 feet at Jones Ave. and Marietta Street, Atlanta, Ga., at a cost of $360,000. The building, which is to be known as the Westinghouse Electric Building, will be constructed according to the company's specifications and will be used as an office, warehouse, and service station. Construction work was started Dec. 1 and will probably be completed by next May.

The Ingersoll-Rand Co. and the A. S. Cameron Steam Pump Works announce the opening of a branch office at 718 Ellicott Square Building, Buffalo, N. Y. This new office is equipped to render full service to those interested in air, gas and ammonia compressors, vacuum pumps, turbo blowers and compressors, condensers oil and gas engines, pneumatic tools, rock drills, centrifugal and direct-acting pumps and other of the numerous products manufactured by these Companies.

The Ramona Supply Co. of Ramona, Calif., has been incorporated for the purpose of carrying on a wholesale lumber and machinery business. The incorporators are A. C. Bisher, Pearl Bisher and Warren Libby, the first two living at Ramona and the latter at San Diego, Calif.

Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Press, Broach, Bench, on Pedestal

American Broach & Machine Co., Ann Arbor, Mich.

"American Machinist," November 16, 1922

The power-operated press is intended especially for broaching small holes and keyways, and is operated by belt on a constant-speed pulley. Power is transmitted through a worm and worm gear to the ram. The ram is controlled by a positive jaw clutch and is raised by a counterweight after the power has been disengaged. The machine is fitted with an automatic stop. It can also be operated by hand power. Approximately 2 tons pressure can be obtained. An oil receptacle in the pedestal can be connected to an oil pump. The table has a 2½ in. hole. Maximum stroke, 14 in. Capacity, work 6 in. in diameter. Height table to floor, 36 in. Weight with pedestal, 315 pounds.

Reamer, Line, Expansion, Piston, "Nu-Angle"

Vedoe-Peterson Co., Norfolk Downs, Mass.

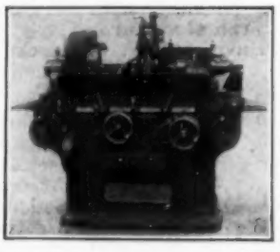
"American Machinist," November 16, 1922

The reamer is used in reaming piston-pin bushings. The six blades are placed at angles to the axis so as to minimize chatter and gouging. The size can be adjusted through a range of 0.030 in. The tool is equipped with a pilot and an expanding sleeve, so that the two holes in the bushing will be exactly aligned. The tool is guided and supported by the solid pilot and the expanding sleeve on one bearing while reaming the opposite bearing. The reamer is made in nine sizes. The diameters available range from 0.66 to 1.14 in. and the lengths from 9¼ to 12¼ in. Three reamers can be furnished to ream the piston-pin bushings employed in the great majority of automobile motors. The tools are packed in wooden boxes.

Grinding Machine, Cylindrical, Plain, 12-Inch

Cincinnati Grinder Co., Oakley, Cincinnati, Ohio

"American Machinist," November 23, 1922

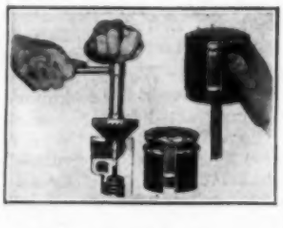


The working mechanism has been redesigned, and the machine is intended for grinding straight or tapered spindles, shafts, rolls or any work revolved on centers. It is made in 18, 24, 36, 48 and 72-in. work lengths, with either belt or motor drive. The spindle is driven directly from the countershaft. Control is centralized on the front of the machine. Any unit may be easily removed. The spindle and the table have six work speeds each, obtained through a single gear box. When the power traverse to the table is engaged, the handwheel is automatically disengaged and remains stationary during the table travel. When the power traverse is disengaged, the handwheel is automatically engaged. The crossfeed may be either hand or automatic.

Garage Tools, Valve-Reseater, Piston Sleeves, "Speed Up"

Stevens & Co., 375 Broadway, New York, N. Y.

"American Machinist," November 23, 1922



The tools are for use in repairing automotive engines. By means of the reseating tool at the left, valves on all 45-deg. removable-head motors can be reseated. It is not necessary to change the pilots or cutters for different sizes. The pilot is made in one piece, stepped off for four sizes of valve stems, 5/16, 3/8, 7/16 and ½ in., each step being slightly tapered. The pilot telescopes into the handle and is forced outward by means of a coil spring, seating itself in the valve guide. The sleeves on the right are for fitting rings to pistons, and can also be used when slipping assembled pistons into the cylinder block. The sleeve is split and is made in five sizes to fit diameters from 2⅜ to 5¼ inches.

Draftsmen's Set, "Leroy & Ames," No. 100

Edgar Bourquin, 1353 Main St., Waltham, Mass.

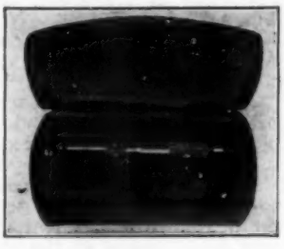
"American Machinist," November 16, 1922

The set consists of pens and a lettering instrument for the use of draftsmen and engineers. The Ames lettering instrument is a steel frame holding a celluloid disk which may be rotated in it. In the disk are three parallel rows of tapered holes for drawing guide lines for lettering. Compartments hold the pens, with a special celluloid holder for the Leroy tubular pens. The pens are of the fountain type and are adaptable to both ruling and lettering. Each tube has a removable cleaner. The width of the line made depends upon the width of the point, and the tube points are interchangeable in the swiveling socket, which can also hold Gillott's crow quill pens. Smaller sets than shown can be furnished.

Micrometer Case, Pocket

Brown & Sharpe Manufacturing Co., Providence, R. I.

"American Machinist," November 16, 1922

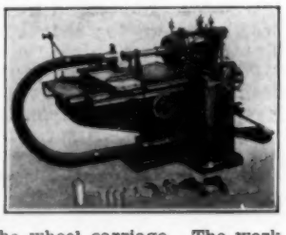


The case is for holding 1-inch micrometer calipers and is designed to fit the pocket without taking up much room or causing a large bulge. Its use protects the micrometer from dirt or injury when carried in the pocket. The case is made of metal covered with leather and lined with plush. It is furnished in two styles, the No. 202 for the standard micrometer made by the concern, and the No. 203 for the "Rex" micrometer. The inside of the case is so shaped as to hold the micrometer securely in position and prevent it from moving.

Grinding Machine, Cylinder, "Madison"

Gisholt Machine Co., Madison, Wis.

"American Machinist," November 23, 1922

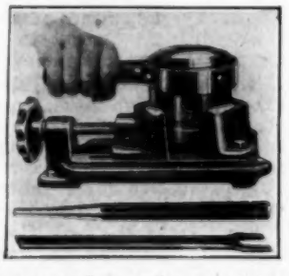


The machine is adaptable to all kinds of automotive cylinders with the use of the standard equipment only, and can be employed on either open-head or closed-head cylinder blocks. The wheel spindle is of the two-piece type, and so for average work the outer spindle can be short and rigid. The rotary motion of the eccentric sleeve is controlled through a friction clutch and the amount can be adjusted while the head is in motion. The horizontal adjustment of the wheel to the work is obtained by movement of the wheel carriage. The work table can be moved vertically, as well as parallel to the wheel spindle to feed the cylinders to the wheel. Adjustable stops automatically trip and reverse the feed. An exhaust fan is mounted on the base. Floor space, 71 x 57¾ in. Weight, 2,600 pounds.

Garage Tools, Piston Vise, Groove Cleaner, Punch and Prongs, "Speed Up"

Stevens & Co., 375 Broadway, New York, N. Y.

"American Machinist," November 23, 1922



The vise is for holding pistons, speedometer heads, clocks, ball bearings and universal-joint parts. Four points of contact on the work are provided, the jaws being lined with lead. Capacity, 5¼ in. in diameter. Weight, 13 lb. The cleaner is a metal band with four V-shaped points on the inside fitting into the piston groove. It is made in two sizes for pistons 3¾ in. in diameter and over, and for smaller pistons. The 12 in. Giant punches are for use in lining up holes for assembling and in driving pins and bolts. They are made in three sizes having point diameters of ⅜, 7/16 and ½ in. The 16-in. utility prong is for general use when repairing parts.

Clip, paste on 3 x 5-in. cards and file as desired

Personals

JAMES A. BENNETT has recently been appointed sales manager of the Connecticut Telephone & Electric Co., manufacturers of telephone and electrical supplies, Meriden, Conn.

FRANK L. COGILL, president of the Coulter & MacKenzie Machine Co., manufacturers of machinery, etc., Bridgeport, Conn., has returned to this country, after an extensive business trip through the European countries.

C. G. HOERLE, secretary of the Union Hardware Co., hardware manufacturers, of Torrington, Conn., has recently been appointed an Aide-de-Camp on the Staff of Governor-elect Charles A. Templeton, of Connecticut.

CLIFTON T. BROWNELL, president of the Brownell Machinery Co., dealers in machinery, 11 Eddy St., Providence, R. I., has purchased for his concern the property and buildings at the corner of Waterman and East River Streets, Providence. The lot consists of about 77,000 square feet of land, and the wooden buildings on same will be utilized as storage space of machinery by the Brownell Company.

GENERAL LUCIUS B. BARBOUR of Hartford, Conn., has been elected a director of the Landers, Frary & Clark Corp., manufacturers of cutlery, tools, etc., New Britain, Conn., to succeed his father, the late General Lucius A. Barbour.

CHARLES N. REPLOGLE, well known in the iron and steel business of the country, and formerly general manager of the Cambria Steel Co., was recently elected president and general manager of the Brightman Manufacturing Co. of Columbus, Ohio, succeeding W. C. Wagoner.

E. J. PERKINS, president of the Bessemer Metal Products Co., of Bessemer, Ala., advises that the company plans to manufacture a more or less complete line of metal automobile parts, including pistons, piston rings, connecting rods, etc.

GEORGE U. HATCH has been elected vice-president of the Millers Falls Co., Millers Falls, Mass., and will continue to have charge of sales, a position he he filled for three years since leaving the sales organization of the Winchester Repeating Arms Co.

FRANK B. ADAMS of Greenfield, Mass., has resigned as commercial representative of the New England Telephone and Telegraph Co. in that district to become director of welfare and first aid for the Detroit Steel Products Co., Detroit, Mich., for which concern his son is sales manager.

A. L. MEYERS, who has been connected with the R. K. LeBlond Machine Tool Co., Cincinnati, for the past sixteen years, has been transferred from the general superintendency of that company to the sales force of the same corporation and will have charge of the field work.

FRANK HOFFSTETTER, who has been assistant superintendent of the R. K. LeBlond Machine Tool Co., Cincinnati, has resigned his position to go with the Seifert & Woodruff Co., of Cincinnati. He will have charge of the sales end of their machine tool supplies.

E. C. BRANDT, works manager of the Westinghouse-Krantz Works, has been appointed works manager of the new plant now being erected by the Westinghouse Electric & Manufacturing Company in Homewood, Pittsburgh.

W. R. BASSICK, formerly vice-president and general manager of the Bassick Co., Bridgeport, Conn., has been elected president of the newly formed Turner & Seymour Manufacturing Co., Torrington, Conn.

H. L. SUTTON, formerly general manager of the American Tube and Stamping Co., has been elected vice-president of the Turner & Seymour Manufacturing Co., Torrington, Conn.

WILLARD L. CASE, formerly treasurer of the Yale & Towne Manufacturing Co., has been elected secretary-treasurer of the newly formed Turner & Seymour Manufacturing Co., Torrington, Conn.

G. MIL HORTON, general manager of the Cisco Machine Tool Co., has tendered his resignation to take effect Jan. 1, 1923.

ELBERT E. LOCHRIDGE, chief engineer of the Springfield municipal water system, has been elected president of the Engineering Society of Western Massachusetts to fill the vacancy caused by the recent death of Dr. Herbert C. Emerson.

CHARLES A. BICKETT, formerly with the Bickett Machine and Manufacturing Co., has organized a new plant, under the name of Bickett-Miller Co., to continue the manufacture of the Bickett line of bench millers and do special engineering and machine work.

Obituary

JOHN H. BASS, 87 years old, manufacturer and philanthropist, died at his home in Fort Wayne, Ind., last week after a lingering illness. Mr. Bass was the founder of the Bass Machine and Foundry Co. of that city. In addition to extensive industrial and commercial interests in Fort Wayne, he was identified with manufacturing plants in Chicago, St. Louis and in mining and steel industries in Alabama and Tennessee.

FRED A. MARSH, the general purchasing agent of the Link-Belt Co., died at his home, No. 6436 Greenwood Ave., Chicago, Dec. 11, at the age of 52 years. Mr. Marsh was a member of the Link-Belt organization for over 33 years, was one of the organizers of the Purchasing Agents Association of Chicago, and served as its first president. He was also for several years a director in the National Association of Purchasing Agents.

DON H. BACON, formerly president of the Tennessee Coal, Iron and Railroad Co., and who retired from active business life in 1906, died recently at his home in St. Augustine, Fla., where he lived during the winter months. His summer home was at New York City. Prior to becoming president of the Tennessee Company, Mr. Bacon was with the Minnesota Iron Co. in an executive capacity at the time this concern was purchased by the United States Steel Corporation. During this period he was prominently identified with the iron development of the northwest. He built a winter home at St. Augustine in 1916.

GEORGE J. FOSTER, a life long resident of Montreal, died Dec. 20, at the age of 50. Mr. Foster was president and managing director of Steel Specialties Co. of Canada, Ltd.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Electrical refrigerators for homes—Switzerland. Agency desired. Quotations, f. o. b. New York. Terms: Payment against documents. Catalogs requested. Reference No. 4754.

Small electric heaters for home use, and electrical machinery and apparatus of all kinds—Spain. Purchase desired. Quotations, c. i. f. Corunna or Vigo. Terms: Cash against documents in New York. Correspondence, Spanish or French. Reference No. 4755.

Hardware, utensils, tools, valves and automobile supplies—Italy. Agency and purchase desired. Quotations, c. i. f. Genoa. Reference No. 4718.

Hardware, including tools, locks, axes, hatchets, paints and varnishes, and watches and clocks—South Africa. Agency desired. Reference No. 4717.

Hardware, tools and implements of every description — Poland. Agency desired. Quotations, c. i. f. Danzig. Reference No. 4719.

Forthcoming Meetings

American Engineering Council, Annual Meeting, January 11 and 12, at the headquarters of F. A. E. S., 24 Jackson Place, Washington, D. C. L. W. Wallace, Secretary.

National Automobile Chamber of Commerce, National Automobile Show, January 27 to February 3, 1923, Coliseum and First Regiment Armory, Chicago, Ill.

Society of Automotive Engineers, annual meeting, Jan. 9 to 12, 1923, Engineering Societies Building, 29 West 39th St., New York City. C. F. Scott is chairman.

American Institute of Electrical Engineers, Mid-Winter Meeting, February 14 to 16. Engineering Societies Bldg., New York. F. L. Hutchinson, Secretary.

American Society for Steel Treating, Winter Sectional Meeting, City Club, Chicago, Ill., Feb. 15 and 16, 1923. National Secretary, W. H. Eisenman, 4600 Prospect Ave., Cleveland, Ohio.

Universal Patent Exposition, First Annual Convention and exhibit of patents and inventions, Grand Central Palace, New York City, February 17 to 22, 1923. A. B. Cole, 110 West 40th St., New York City, is chairman.

American Institute of Mining and Metallurgical Engineers, Annual Meeting, February 19 to 21. Engineering Societies' Bldg., New York. F. S. Shartless, Secretary.

American Foundrymen's Association, Annual convention, and exhibition at Public Hall, Cleveland, Ohio, April 30 to May 3, 1923. C. E. Hoyt, 140 South Dearborn St., Chicago is secretary.

American Electro Chemical Society, Semi-annual meeting, Hotel Commodore, New York City, May 3 to 5, 1923. Colin G. Fink, 327 South La Salle St., Chicago, Ill., is secretary.

National Supply and Machinery Dealers' Association; Southern Supply and Machinery Dealers' Association; and the American Supply and Machinery Manufacturers' Association, triple convention, in Cincinnati, Ohio, May 17, 18, 19, 1923. F. D. Mitchell, 1819 Broadway, New York City, is secretary.

American Society for Testing Materials, Annual meeting at Atlantic City, June, 1923. C. L. Warwick, 1315 Spruce St., Philadelphia, is secretary.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Advances—Current business on steel shapes, plates and bars, firm at $2 per 100 lb., Pittsburgh, despite weakening of market in light rails and forging billets. On especially attractive tonnages $1.90 is possible, particularly for car material. The minimum on bars, however, is placed at $1.95, and that to large and preferential buyers only. Copper, lead and tin markets all firmer in tone. Electrolytic copper, up ⅛c.; tin, 1⅛c. and lead ¼c. per lb. in New York warehouses during week. Copper sheets, wire and tubing advanced ⅛c. and copper bars, brass sheets and wire, ¼c. per lb. Old metals, non-ferrous, also up ⅛c.@1⅛c. per lb.

Declines—Zinc quoted at 7¼c. as against 7⅜c. per lb. in New York warehouses, despite firmness of other metals. Linseed oil market sluggish but prices steady. Coke, both furnace and foundry, down 50c. per ton during week.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$27.05
Northern Basic	29.27
Southern Ohio No. 2	28.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	34.44
BIRMINGHAM	
No. 2 Foundry	23.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	29.14
Virginia No. 2	34.17
Basic	27.50
Grey Forge	28.64
CHICAGO	
No. 2 Foundry local	28.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	29.01
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	25.00
Basic	25.00
Bessemer	27.50

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.0
Cleveland	5½@6
Cincinnati	4.5@6
New York	5.5
Chicago	4@5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.50	4.19	3.70	4.00
No. 12	2.60	4.24	3.75	4.05
No. 14	2.70	4.29	3.80	4.10
No. 16	2.90	4.39	3.90	4.20
Black				
Nos. 17 and 21.	3.20	4.30	4.20	4.70
Nos. 22 and 24.	3.25	4.35	4.25	4.70
Nos. 25 and 26.	3.30	4.40	4.30	4.75
No. 28	3.35	4.50	4.40	4.85

Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	3.35	4.50	4.40	4.85
Nos. 12 and 14.	3.45	4.60	4.50	4.95
Nos. 17 and 21.	3.75	4.90	4.80	....
Nos. 22 and 24.	3.90	5.05	4.95	5.40
No. 26	4.05	5.20	5.10	5.55
No. 28	4.35	5.50	5.40	5.90

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel			BUTT WELD	Iron	
Inches	Black	Galv.	Inches	Black	Galv.
1 to 3	66	54½	¾ to 1½	34	19
			LAP WELD		
2	59	47½	2	29	15
2½ to 6	63	51½	2½ to 4	32½	19
7 to 8	60	47½	4½ to 6	32½	19
9 to 12	59	46½	7 to 12	30	17
			BUTT WELD, EXTRA STRONG, PLAIN ENDS		
1 to 1½	64	53½	¾ to 1½	34	20
2 to 3	65	54½			
			LAP WELD, EXTRA STRONG, PLAIN ENDS		
2	57	46½	2	30	17
2½ to 4	61	50½	2½ to 4	33	21
4½ to 6	60	49½	4½ to 6	32	20
7 to 8	56	43½	7 to 8	25	13
9 to 12	50	37½	9 to 12	20	8

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. steel butt welded.	57%	44%	55½%	43½%	62½%	48½%
2½ to 6 in. steel lap welded.	54%	41%	53½%	40½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 6%. Cast iron, standard sizes, 32% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	6.03	8.00	6.10
Hoop steel	4.39	3.71	3.90
Cold rolled strip steel	6.75	8.25	7.25
Floor plates	5.50	5.16	5.50
Cold finished shafting or screw	3.90	3.75	3.70
Cold finished flats, squares	4.40	4.25	4.20
Structural shapes (base)	3.14	3.01	3.02½
Soft steel bars (base)	3.04	2.91	2.92½
Soft steel bar shapes (base)	3.04	2.91	2.92½
Soft steel bands (base)	3.84	3.61	3.55
Tank plates (base)	3.14	3.01	3.02½
Bar iron (2.60 at mill)	3.04	2.91	2.92½
Drill rod (from list)	55@60%	40%	50%
Electric welding wire:			
5/32	8.00		12@13
1/8	6.50		11@12
1/16 to 1/4	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			15.37½
Tin, 5-ton lots, New York			39.00
Lead (up to carlots), St. Louis	7.05;	New York,	7.62½
Zinc (up to carlots), St. Louis	7.05;	New York,	7.50

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	25.20	23.00	23.00
Antimony (Chinese), ton spot	7@7.25	8.37½	7.75
Copper sheets, base	22.00	22.00	23.00
Copper wire (carlots)	16.50	18.00	16.25
Copper bars (ton lots)	20.25	23.00	19.50
Copper tubing (100-lb. lots)	25.25	25.00	23.00
Brass sheets (100-lb. lots)	18.75	20.75	18.75
Brass tubing (100-lb. lots)	23.00	24.00	20.50

—Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (1,000-lb. lots)	17.00	19.00	15.75
Brass wire (carlots)	19.25	20.75	.....
Zinc sheets (casks)	10.25	10.25	.....
Solder (½ and ½), (caselots)	27.50	24.75	20.00
Babbitt metal (83% tin)	42.00	47.00	36.00
Babbitt metal (35% tin)	25.00	17.50	.....
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J	39.00	.....	....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.50	12.50	12.00
Copper, heavy, and wire	12.25	11.75	11.50
Copper, light, and bottoms	10.50	10.00	10.50
Lead, heavy	5.75	5.50	5.75
Lead, tea	5.25	4.50	4.75
Brass, heavy, yellow	7.00	....	....
Brass, heavy, red	9.50	9.50	9.50
Brass, light	6.00	5.50	6.00
No. 1 yellow brass turnings	7.00	6.50	7.00
Zinc	4.50	4.00	4.50

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	23.00	21.00	20.90
"A" Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.00	11.50	14.50
IC,	112 sheets	12.30	11.90	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	6.00	7.25
IC,	14x20	7.25	6.25	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.09@$0.11½	$0.12	$0.11½
Cotton waste, mixed, per lb.	.065@.10	.09	.08
Wiping cloths, 13½x13½, per lb.	.16	32.00 per M	.10
Wiping cloths, 13½x20½, per lb.	.20	48.00 per M	.13
Sal soda, 100 lb. lots	2.80	2.40	2.65
Roll sulphur, per 100 lb.	2.90	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.93	1.01	.95
White lead, dry or in oil	100 lb. kegs.	New York,	13.25
Red lead dry	100 lb. kegs.	New York,	13.25
Red lead, n oil	100 lb. kegs.	New York,	14.75
Fire clay, per 100 lb. bag		.65	
Coke, prompt furnace, Connellsville	per net ton	$6.50	
Coke, prompt foundry, Connellsville	per net ton	7.00@7.50	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	40%	50-10-5%	50%
1½ and 1¼x3 in. up to 12 in.	20%	50%	50%
With cold punched sq. nuts	25%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	15%	3.90 net	.....
Hex. head and hex. nut bolts	20%	.....	65-5%
Lag screws, coach screws	40%	.....	60-5%
Square and hex. head cap screws	75%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	30%	40-10%	45%
Bolt ends, with hot pressed nuts	40%	.....	55%
Tap bolts, hex. head, list plus	20%	.....	.....
Semi-finished nuts ⅝ and larger	60%	70%	80%
Case-hardened nuts	50%	.....	....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.00	$3.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	4.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	3.00	5.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, hex., per 100 lb. Off list	1.00	3.00	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	45%	60%	60%
Rivets, tinned	50%	60%	4½c. net
Button heads ½-in., ¾-in., 1x2 in. to 5 in., per 100 lb (net)	$5.00	$3.90	$3.75
Cone heads, ditto (net)	5.10	4.00	3.85
1½ to 1¾-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅜ in. diameter *EXTRA*	0 15	.....	0.15
½ in. diameter *EXTRA*	0 50	.....	0.50
1 in. long, and shorter *EXTRA*	0 50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	...	$3.70 base
Copper rivets	55-5%	50%	50%
Copper burs	35%	50%	20%

Lard cutting oil (50 gal. bbl.) per gal.	$0.50	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.33	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, New York, per ply, 12-in. wide, per lin.ft., $2.88:			
Medium grade	30-10%	40½%	50%
Heavy grade	20-5-2½%	30-5%	40-5%
Rubber and duck:			
First grade	60-5%	50-10%	40-10%
Second grade	65-10%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.84	$5.84	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.50	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.32	1.24	1.40
Cloth	3.02	2.67	3.20

New and Enlarged Shops

Machine Tools Wanted

Ark., Fort Smith—T. H. Lyon, 1004 Garrison Ave.—jeweler's electric power lathe.

Calif., Eureka—Bd. Educ., G. B. Albee, Secy., receiving bids until Jan. 2, one No. 1½ Cincinnati Universal cutter and tool grinder, complete with cylindrical grinding attachment; internal grinding attachment; gear cutter sharpening attachment; surface grinding attachment; case for storing the parts and attachments; trueing diamond and holder; one engine lathe, 14 in. swing, 6 ft. 6 in. bed, quick change gears and 2 semi-finished chuck plates, follower rest and standard equipment and taper attachment for one lathe; Lodge & Shipley or equal (a) single pulley or constant speed drive (b) cone drive (c) one to six in. 3 jaw Universal chuck, inside and outside jaws for each lathe (⅝)1- 12 in. independent chuck for each lathe; one 12 in. Clizby imperial grinder head with counter-shaft and guards; one Metcalf emery wheel dresser, type A; one Buffalo combine armor plate punch and shear with metal stand (a) No. 3 B (b) No. 4 B; one Wicks continuous blue print machine No. 15 for A. C. 110 volt, 60 cycles; two No. 2 double Superior soldering furnace (for manufactured gas); one Oxweld or equal low pressure acetylene gas generator, 50 lb. capacity and the following equipment: one welding blowpipe complete with 5 welding heads, one cutting blowpipe complete with 5 nozzles; four sheet metal blowpipes complete with tips, one lead burning blowpipe complete with tips, one oxygen cutting regulator, 2 guages; 5 r-8 oxygen regulators. Alternate bid, welding outfit: provide the number of torches as listed, and all other necessary equipment so that gas from acetylene cylinders may be used in place of the acetylene generator. Bids must specify items to be furnished which must include truck to make the outfit easily portable. Sheet metal equipment: one No. 681 cornice break, one No. 381 slip roll pattern forming machine, one No. 137 B squaring shear, one No. 548 wiring machine, one 4 in. Wiss combination snips, one No. 911 hollow mandrel stake, one No. 925 blowhorn stake, one No. 935 coppersmiths squaring stake, two 14 oz. riveting hammers, one No. 63 folding machine, one No. 587 crimping and beading machine, one No. 547 turning machine, one Pexto bench shear No. 3, one 4 in. Bartlett compound lever snips, one No. 901 Beakhorn stake, one No. 931 bevel edge squaring stake, one No. 941 hatchet stake, one 14 oz. setting hammer, one rivet set.

Ill., Chicago—Pullman Co., East 112th St. and Cot Grv.—one 18 in. slotter; one 48 in. open side planer with a 20 ft. bed; one 5 or 6 ft. radial drill; one 10 in. slotter; one 36 in. x 36 in. x 8 ft. bed, or longer, planer with 4 heads; one 36 in. swing heavy duty drill press with compound table and tapping attachments; one 20 in. shaper.

Mass., Cambridge—Cambridge Motor Co., 195 Massachusetts Ave. — machinery and equipment for garage.

Mich., Detroit—F. Colman & Sons, 1520 15th St., (tool work)—grinders and miscellaneous machine shop equipment.

Wash., Centralia—McDowell Bros., 721 North Tower St.—one quick change machinist's lathe, 16 to 18 in. swing, 8 ft. bed, electric drive; one welding outfit complete, either gas or electric; one 2 wheel pedestal grinder, 1 wet, 1 dry wheel.

Wis., Janesville—J. A. Strimple, 219 East Milwaukee St.—power and automobile repair machinery, also pumps, for proposed garage.

Wis., Madison—Capitol City Garage Co., South Pinckney St.—power machinery and automobile repair machinery for proposed $60,000 garage on Washington St.

Machinery Wanted

Ala., Auburn—Young Lumber Co.—machinery and equipment for lumber mill, to replace that which was destroyed by fire.

Ark., El Dorado—H. Byrens, Box 1025, (oil producer)—two oil pumps, one visible gasoline pump, air compressor, five 5,000 barrel oil tanks and 6, 8 and 10 in. pipe.

Ill., Chicago—H. J. Delson Co., 749 North Western Ave., (job printer)—14 x 22 in. and 13 x 19 in. presses, also motors for same.

Ill., Peoria—Meyer Furnace Co., 1300 South Washington St.—equipment for furnace factory, to replace that which was destroyed by fire.

Ind., Fort Wayne—Fort Wayne Box Co., Calhoun and Superior Sts.—machinery for proposed box factory.

Ky., Ashland—Amer. Rolling Mill Co.—cranes.

Ky., Louisville—Mengel Body Co., A. Allen, Pres.—machinery and equipment for the manufacture of auto truck bodies.

Mass., Dorchester (Boston P. O.)—W. Marade Co., 387 Bowdoin St., (manufacturer of advertising specialties) — multicolor press (used).

Mass., Fitchburg — Star Worsted Co.—machinery, including looms, etc., for addition to woolen mill.

Mass., South Braintree (Boston P. O.)—H. W. Bailey & Co.—folding machine large enough for 7 column newspaper.

Mass., Worcester, — Queensbury Mills, Inc., Quinsigamono Ave.—machinery for additions to yarn mill.

Mich., Detroit—E. Elchman, 3102 Roosevelt Ave.—equipment for the manufacture of patented expander and contractor for automobile tires.

Mich., Detroit—Ervin Stamping Co., 25 East Atwater St., (metal stamping)—miscellaneous equipment for making metal parts; shop trucks; dipping tanks for enameling.

Mich., Detroit—Stewart Auto Top Co., 83 East Milwaukee Ave.—band saw and equipment.

Mich., Grand Rapids—Bd. Educ., H. Morrill, Business Mgr., City Hall — manual training equipment for proposed Junior High School.

Miss., Moss Point—Southern Paper Co.—machinery and equipment for pulp paper mill.

Mo., Joplin—W. W. Kersey, 2005 Empire Ave.—oil driller.

Mo., St. Louis — Germo Mfg. Co., 111 South Main St.—two steel-jacketed, 500 gal. kettles.

Mo., St. Louis—Z. Zimmerly, 5532 Magnolia Ave.—7 x 11 in. Pearl or 8 x 12 in. Chandler-Price printing press

Neb., Omaha—Union Pacific R.R., 15th and Dodge Sts., G. C. Smith, Purch. Agt.—$5,900,000 worth of equipment, including 78 new freight engines.

N. Y., Addison—H. Austin—ice cream manufacturing machinery for plant at Canisteo.

N. Y., Jamestown—Jamestown Metal Desk Co., 104 Blackstone Ave.—machinery and equipment for proposed addition to factory.

N. Y., Rochester—G. Slanord, 1839 Highland Ave.—one power drag saw and equipment.

O., Columbus—W. E. Lamneck Co., 5th Ave. along tracks of Hocking Valley R.R., (manufacturer of furnaces and metal products), A. P. Lamneck, Secy. and Treas.—metal working machinery to enlarge plant.

O., Lima—Lima Sheet Metal Wks.—sheet metal working machinery.

O., London—M. J. Kehoe Co.—machinery for the manufacture of power washing machines.

O., Washington C. H.—G. D. Baker & Co., (manufacturer of hardwood flooring)—woodworking machinery, including saws, planers, molders, etc.

Ore., Astoria—Hammond Lumber Co.—machinery and equipment for saw and planing mill, and sash, door and box factory.

Pa., Allentown—Lehigh Valley Poster Co.—machinery and equipment for proposed poster plant.

Pa., Etna (Pittsburgh P. O.) — Spang Chalfant Co.—10 ton crane.

Pa., Hughesville—Hughesville Furniture Co., W. M. Engel, Pres.—machinery and equipment for additions to furniture plant.

Pa., Lancaster—J. H. Hartman, Elizabeth Ave. and Plum St.—machinery and equipment for the manufacture of toy banks, etc.

Pa., Mars—Velte Fdry. and Machine Co.—pattern shop and foundry equipment.

Pa., Monessen—Monessen Fdry. and Machine Co.—10 ton crane.

Pa., Oil City—T. F. Fleickenstein—bakeshop equipment.

Pa., Pittsburgh—Carnegie Steel Co., Carnegie Bldg.—Gantry crane for West Braddock docks.

Pa., Pittsburgh—Pennsylvania R.R., Pennsylvania Sta., W. G. Phelps, Purch. Agt.—600 ton wheel press.

Pa., Sharon—H. J. Chadderton—coal coal mining machinery and equipment for coal deposits to be developed near Mercer.

Pa., Slatington—O. B. Brush Co., J. G. Rauch, Dir.—machinery and equipment for the manufacture of brushes.

Pa., Titusville—Cycloys Steel Co., C. T. Evans, Supt.—machinery and equipment for the manufacture of a new process combination metal and alloy steel.

Pa., Yorkhaven—E. E. Brunner, c/o State Bank—machinery and equipment for the manufacture of paper and saturating felt.

Tex., Fort Worth—Alford Ice Co., Jasemine and Jennings Sts.—$45,000 worth of ice machinery.

Tex., Port Arthur—Bd. Educ.—lathes, planers, etc., for manual training department of proposed grade school.

Va., Alexandria—G. Carroll, Box 11—machinery for the manufacture of electric storage batteries.

Va., Bristol—Lincoln Furniture Co., C. Lincoln, Pres.—machinery and equipment for $100,000 addition to plant.

W. Va., Ronceverte—Midland Smokeless Coal Co., C. Thompson, Pres.—conveying, transmission machinery and other mine equipment.

Wis., Almond—A. Pagel—machinery and equipment for new feed grinding mill.

Wis., Crandon—Forest County Bd., F. J. Rogers Comnr.—$8,000 worth of road machinery, including gravel crushing equipment.

Wis., Marshfield—L. Kohl, 110 West 4th St.—mechanical equipment for baking process, to bake paint on automobiles.

Wis., Milwaukee—Gas Tank Recharging Co., 1245 23rd Ave.—air compressors for proposed plant at West Allis.

Wis., Milwaukee — Milwaukee Vinegar Co., 79 Buffalo St.—yeast presses and hoppers for proposed yeast house at Cudahy.

Wis., Ripon—Ripon Produce Co., A. E. Wells, Secy.—power and dairy machinery for proposed plant at Stetsonville.

Wis., Sheboygan—Sheboygan County Bd., G. W. Ubbelohde, Chn., Court House,—gravel pit machinery, conveyors, etc., for road use.

Wis., South Madison (Madison P. O.)—Bd. Educ., E. Reggert, Chn.—manual training equipment for new high school.

Wis., Waunakee—Waunakee Canning Co., c/o A. P. Kenney, Waunakee State Bank—canning machinery and power machinery for proposed factory.

Ont., Cobalt—Coniagas Mines, Ltd.—crushing equipment to enlarge production to 150 ton per day.

Ont., Midland—Pratt & Shanacy, (lumber), J. Pratt, Purch. Agt.—one lath machine and one bolter, capacity 35,000 per day.

Ont., Niagara Falls—Twp. of Stamford, T. R. Stokes, Clk.—rock crusher.

Ont., Ottawa—Dept. Public Wks., R. C. Desrochers, Secy.—receiving bids until Jan. 31, dry dock machinery for Esquimalt, B. C.

Ont., Ottawa—McAuliffe-Davis Lumber Co.—woodworking machinery.

Ont., Timmins—Hollinger Consolidated Gold Mines, Ltd.—machinery to double present capacity of plant, (4,500 ton per day), including crushers, drills, conveying equipment, stamp mills, amalgamators, etc.; also cranes for proposed power plant.

Que., Lachine—La Pailleur Freres, Ltd., 405 St. Joseph St., L. LaPaulteur Purch. Agt.,—stone crushing machinery.

Que., Montreal—O. Martineau & Fils, Ltd., 371 Marie Anne, E.—additional quarrying and stone crushing equipment.

Que., Quebec—Jobbin & Genois, Abraham Hill—machinery and equipment for proposed marble manufacturing plant at Riviere a Pierre.

Que., Quebec—Quebec Development Co., Union Bank Bldg.—stone crushing machinery.

Que., St. Moise—Tartague Lumber Co., Ltd., J. Dufort, Purch. Agt.—saw mill equipment; later, equipment for shingle mill and sash and door factory.

Que., Victoriaville—A. Le Houillier—complete sawmill equipment.

Metal Working Shops

Calif., Petaluma—Fuller & Peters, Main and Bridge Sts., plan to build a 50 x 112 ft. garage on North Main St. Architect not selected.

Calif., San Francisco — T. Hamill, 6140 Geary St., will build a 2 story automobile repair shop, etc., on Gear St. near Blake St. Estimated cost $10,500.

Calif., San Francisco—L. R. Lurie, Mills Bldg., awarded the contract for the construction of a 1 story machine shop on 10th and Minna Sts. Estimated cost $13,000. Noted Dec. 14.

Calif., Stockton—The H. Cowell Estate c/o W. H. George, Secy., 2 Market St., San Francisco, is having plans prepared for the construction of a 1 or 2 story, 80 x 100 x 150 ft. garage on Hunter and Channel Sts., here. Estimated cost $50,000. H. H. Meyers, Kohl Bldg., San Francisco, Archt.

Calif., Tulare—The Tulare Union High School District is having plans prepared for the construction of addition to auto mechanics building, also for remodeling and building additions to manual arts building. Estimated cost $22,000. Swartz & Ryland, Rowell Bldg., Fresno, Archts.

Conn., Bridgeport—The Lacey Mfg. Co., 50 Middle St., manufacturer of dies, tools, etc., plans to build a 2 story factory on Connecticut and Union Aves. Estimated cost $35,000. Architect not selected.

Conn., New Haven—The Eastern Machine Screw Co., Truman and Barclay Sts., awarded the contract for the construction of a 1 story, 30 x 30 ft. addition to its factory. Estimated cost $5,000.

Ill., Chicago—The Electrical Dealers Supply Co., 162 West Randolph St., is having plans prepared for the construction of a 3 story, 100 x 250 ft. factory on Diversey St. near Oakley Ave. Estimated cost $150,000. S. N. Crowen, 400 North Michigan Ave., Archt.

Ill., Chicago—The Yellow Cab Mfg. Co., 57 East 21st St., awarded the contract for the construction of a 1 story, 198 x 368 ft. cab assembling factory at 5801 Dickens Ave. Estimated cost $350,000.

Ill., Peoria—The Meyer Furnace Co., 1300 South Washington St., plans to rebuild its furnace factory, which was destroyed by fire. Estimated cost $100,000.

Ind., Fort Wayne—The Knuckle Valve Co., 825 Barr St., awarded the contract for the construction of a 1 story, 75 x 150 ft. valve factory. Estimated cost $26,000.

Ind., Indianapolis—The Amer. Can Co., 120 Bway., New York City, awarded the contract for the construction of a 4 story, 34 x 230 ft. can factory, here. Estimated cost $300,000.

Ind., Indianapolis—The Capitol & St. Clair Realty Co., c/o D. A. Bohlen & Son, Archts., 1001 Majestic Bldg., is having plans prepared for the construction of a 1 story, 112 x 122 ft. automobile service plant on North Capitol Ave. Estimated cost $27,000.

Ia., Denison — G. W. Newton plans to build a 2 story, 85 x 150 ft. garage on Main and Chestnut Sts. Estimated cost $40,000. Architect not announced.

Mass., Everett—The Sexton Can Co., 123 Broad St., Boston, awarded the contract for the construction of a 2 story, 50 x 130 ft. addition to its factory for the manufacture of cans on Cross St., here. Estimated cost $40,000.

Mass., Holyoke—D. O'Connell's Sons, 480 Hampden St., will build a 2 story, 110 x 120 ft. garage on Dwight St. Estimated cost $50,000.

Mass., Pittsfield—The Berkshire Products Corp. is having plans prepared for the construction of an electrical manufacturing plant. Cost between $70,000 and $100,000. G. Southerd, Jr., Genl. Mgr. J. M. Vance, 24 North St., Archt.

Mass., South Boston (Boston P. O.)—The Gillette Safety Razor Co., 41 West 1st St., plans to build an 8 story addition to its factory. Architect not announced.

Mass., Worcester—The Boulevard Park Associates, 339 Main St., awarded the contract for the construction of a 1 story, 45 x 165 ft. garage, etc., on Shrewsbury St. Estimated cost $40,000. J. F. Carberry, Agt.

Mich., Albion — The Service Caster & Truck Co., 316 East Porter St., will soon award the contract for the construction of a 1 story, 50 x 200 ft. factory for the manufacture of roller casters for trucks. Estimated cost $40,000. Private plans.

Mich., Detroit—The Michigan Stamping Co., 11631 Mack Ave., awarded the contract for the constructing of a 1 story, 140 x 347 ft. addition to its metal stamping plant. Noted Dec. 14.

Mich., Grand Rapids—The C. J. Litscher Electric Co., 41 Market Ave., plans to rebuild its 3 story, 60 x 130 ft. factory, which was destroyed by fire. Estimated cost $150,000. Architect not selected.

Mich., Muskegon Heights — The Piston Ring Co. is having plans prepared and will receive bids about February for the construction of a 1 story, 120 x 222 ft. foundry. Estimated cost $75,000. Private plans.

Minn., St. Paul—The L. W. Jordan Co., 118 West 7th St., plans to build a 2 story, 105 x 190 ft. garage and sales building. Estimated cost $65,000. Architect not announced.

N. J., Elizabeth—The Amer. Type Fdry. Co., Communipaw Ave., Jersey City, is having plans prepared for the construction of an administration building, 165 ft. long, and assembling plant, 600 ft. long, 1 and 2 story, on West Grand St., here. Estimated cost $750,000. Day & Zimmerman, 611 Chestnut St., Phila., Engrs.

N. J., Linden—The Layne—New York Co., subsidiary of Layne & Bowler Co., Chelsea Ave., Memphis, Tenn., manufacturer of pumps and screens, awarded the contract for the construction of a small factory, here.

N. Y., Buffalo—S. H. Horn, 217 Leroy Ave., plans to build a factory for the manufacture of automobile bodies at 488 Kensington Ave. Estimated cost $30,000. Architect not selected.

N. Y., Jamestown—The Jamestown Metal Desk Co., 104 Blackstone Ave., is having plans prepared for the construction of a 1 story, 100 x 200 ft. addition to its factory. Estimated cost $40,000. Beck & Tinkham, 317 Washington St., Archts.

N. Y., New York—The Pleasant Ave. Garage Corp., c/o Springsteen & Goldhammer, Archts., 32 Union Sq., will build a 1 story garage on 179th St. and 3rd Ave. Estimated cost $25,000.

N. Y., New York—S. Rubin, c/o C. Schaefer, Jr., Engr. and Archt., 394 East 150th St., will build a 1 story garage on Webster Ave. Estimated cost $45,000.

O., Alliance—The Alliance Machine Steel Castings Co. is having plans prepared for the construction of a 1 story, 75 x 600 ft. addition to its plant. Private plans.

O., Cleveland—The J. L. Free Co., 1040 Prospect Ave., (real estate), awarded the contract for the construction of a 1 story, 90 x 135 ft. sales room and garage at 3746 Prospect Ave. Estimated cost $50,000.

O., Cleveland — The National Screw & Tack Co., 2440 East 75th St., awarded steel contract for the construction of a 5 story, 56 x 165 ft. factory on Platt Ave. Estimated cost $250,000. Noted Nov. 2.

O., Norwood—The Ford Motor Co., Highland Park, Mich., awarded the contract for the construction of an assembling plant and loading platform for automobiles, here.

Pa., Erie — M. Griswold, c/o Griswold Mfg. Co., is receiving bids for the construction of a 2 story, 100 x 150 ft. garage on 20th and State Sts. Estimated cost $40,000. Private plans. Northwestern Motors Co., lessee.

Pa., Monessen—The Monessen Fdry. and Machine Co. awarded the contract for the construction of a 1 story, 32 x 100 ft. core room.

Pa., Phila.—Abbotts Dairy Co., 31st and Chestnut Sts., awarded the contract for the construction of a 3 story, 120 x 140 ft. garage on 3rd and Lombard Sts. Noted Dec. 21.

Pa., Pittsburgh—The Superior Auto Accessories Co., 1342 Forbes St., awarded the contract for the construction of a 1 story, 100 x 145 ft. and 78 x 120 ft. automobile show room and garage on Baum Blvd. and Woodworth St. Estimated cost $50,000.

Pa., Reading—The Biehl Auto & Wagon Wks., 31 South 5th St., is receiving bids for the construction of a 2 story, 85 x 200 ft. factory for the manufacture of automobile equipment. H. G. Mohn, Mohnton, Archt.

Pa., Uniontown—H. Cochrane, c/o H. W. Altman, Archt., Uniontown, is receiving bids for the construction of a 1 story, 90 x 120 ft. garage on Baum Blvd. Estimated cost $85,000.

Pa., Williamsport—The Glosser Motor Car Co., 248 William St., plans to build a 3 story, 43 x 66 ft. garage and automobile machine shop on William and West Church St. Estimated cost $50,000. S. A. and R. J. Glosser, owners.

R. I., Providence—The City Real Estate Co., 4 Weybosset St., is having plans prepared for the construction of a 2 story garage and service station, with capacity for 90 cars on Bway. and Westminster St. Estimated cost $50,000. Private plans.

R. I., Providence — The E. A. Smith Realty Corp., Weybosset St., plans to build a 3 story garage and service station, with capacity for 250 cars on Chapel St. Estimated cost $100,000. Architect not announced.

Tex., Amarillo—The U. & S. Zinc Corp. will soon receive bids for the construction of smelter, also industrial housing. Estimated cost $400,000. Private plans.

Tex., Dallas—The Dallas Gas Co., Logan St., is receiving bids and will open same about Jan. 1, for the construction of a 1 story, 60 x 150 ft. garage and workshop. Estimated cost $65,000. Private plans.

Wis., Cedarburg — The Hansen Canning Machine Corp., Port Washington, awarded the contract for the construction of a 1 story, 112 x 112 ft. factory, here. Estimated cost $40,000. Noted Dec. 7.

Wis., Janesville—J. A. Strimple, 219 East Milwaukee St., awarded the contract for the construction of a 2 story, 113 x 190 ft. garage, to replace the one which was destroyed by fire. Estimated cost $45,000.

Wis., Madison—The Capital City Garage Co., South Pinckney St., is having plans prepared for the construction of a 2 story, 66 x 165 ft. garage and repair shop on Washington St. Estimated cost $60,000. F. L. Kronenberg, Carroll Bldg., Archt.

Wis., Madison—L. F. Schoelkopf, 210 East Washington Ave., plans to build a 1 story, 66 x 150 ft. garage and automobile supply station on East Main St. Estimated cost $50,000. Architect not selected.

Wis., Madison—The University of Wisconsin awarded the contract for the construction of a 4 story, 62 x 68 ft. service station, including garage, electric substation, woodworking shop, etc., on University St. Estimated cost $85,000.

Wis., Madison—The Wisconsin State Hospital Comnrs. are having plans prepared for the construction of a 1 story, 45 x 124 ft. garage. Estimated cost $40,000. Dr. W. F. Lorenz, Mendota St., Secy. A. Peabody, Capitol Bldg., Archt.

Wis., Milwaukee—R. L. Clark, 2218 Meinecke Ave., is having plans prepared for the construction of a 2 story, 100 x 140 ft. garage on 20th St. Estimated cost $65,000. C. H. Tharinger, 3328 State St., Archt.

Wis., Milwaukee — The Harley-Davidson Motor Co., 3732 Chestnut St., awarded the contract for the construction of a 1 story, 80 x 145 ft. foundry. Estimated cost $45,000. Noted Dec.7.

Wis., Milwaukee — The Milwaukee Gas Specialty Co., 2017 Clybourn St., awarded the contract for the construction of a 1 story, 45 x 115 ft. addition to its factory. Estimated cost $45,000. Noted Dec. 7.

Wis., Milwaukee—The South Side Nash Co., 9th and Forest Home Aves., has had plans prepared for the construction of a 1 story, 72 x 93 ft. garage. Estimated cost $40,000. Gurda & Gurda, 2nd Ave. and Mitchell St., Archts.

Wis., Milwaukee—The Welch Investment Co., 105 Wells St., awarded the contract for the construction of a 2 story, 75 x 150 ft. addition to its garage on Grand Ave. Estimated cost $50,000. Noted Dec. 14.

Wis., Wausau—The Durant Motor Car Co., 208 Washington Ave., awarded the contract for the construction of a 2 story, 60 x 60 ft. garage. Estimated cost $40,000. Noted Dec. 7.

Ont., Toronto—C. Pearce, 100 Inglewood Dr., awarded the contract for the construction of a 1 story, 40 x 100 ft. garage on Bathurst St. Estimated cost $25,000.

General Manufacturing

Ala., Auburn—The Young Lumber Co. plans to rebuild the portion of its lumber mill, which was recently destroyed by fire. Estimated cost $30,000.

Calif., Oakland—The Art Rattan Wks., 475 Sutter St., awarded the contract for the construction of a 3 story factory on 24th Ave. near East 12th St. Estimated cost $15,000. Noted Dec. 14.

Calif., Oakland—The California Packing Corp., 101 California St., San Francisco, is receiving bids for the construction of a 1 and 2 story canning plant, consisting of factory and warehouse, on 1st and Filbert Sts., here. P. Bush, 101 California St., San Francisco, Archt. Noted Nov. 16.

Calif., Petaluma—The Petaluma Ice & Cold Storage Co., branch of National Ice & Cold Storage Co., Postal Telegraph Bldg., San Francisco, has had plans prepared for the construction of a cold storage plant, here. Estimated cost, including equipment, $100,000. Private plans.

Calif., Riverbank—C. L. Flack, 1st Natl. Bank Bldg., is interested in a company which is being organized to build a cannery on a 100 x 400 ft. site. Estimated cost $15,000. Architect not selected.

Calif., Sacramento—The Bd. Educ. will receive bids until Jan. 15 for the construction of 4 buildings, comprising gymnasium, domestic science, shops and cafeteria, on 34th St. Estimated cost $540,000. E. A. Matthews, Call Bldg., San Francisco, Archt.

Calif., San Francisco—The California Shade Cloth Co., Inc., 2183 Bryant St., will build a 2 story shade cloth factory on San Bruno Ave. Noted Dec. 21.

Calif., San Francisco—Roth, Winter & Walsh, 1271 Mission St., awarded the contract for the construction of a 2 story, 91 x 120 ft. packing plant on Townsend St. Estimated cost $75,000. Noted Dec. 21.

Calif., San Jose—The De-Hi Food Products Co. plans to build a dehydrating plant on a 5 acre site on Union Ave. A. P. Marston, c/o California Prune and Apricot Growers, San Antonio and Market Sts., Pres. Architect not selected.

Calif., Stockton — The Terminal Cold Storage and Warehouse Co., c/o N. E. MacLean, Archt., 16 California St., San Francisco, is having plans prepared for the construction of a pre-cooling plant on Main Channel and Mormon Slough, here. Estimated cost $260,000.

Conn., Waterbury—The Waterbury Gas Light Co., 83 Center St., will build a 1 story, 40 x 240 ft. addition to its plant on South Leonard St. Estimated cost $33,000.

Ill., Peru — V. A. Matteson, Archt., 8 South Dearborn St., Chicago, is receiving bids for the construction of a 2 story factory to contain 715,000 cu.ft. for the Western Clock Co., here. Estimated cost $250,000.

Ind., Cannelton — The Cannelton Sewer Pipe Co. plans to build a 4 story, 62 x 208 ft. clay plant, including 8 kilns, radial stack, power plant, etc. Estimated cost $240,000. Private plans.

Ind., Evansville—The Evansville Packing Co., Morgan Ave., is having plans prepared for the construction of a 3 story, 31 x 42 ft. packing plant. Estimated cost $45,000. H. E. Boyle & Co., Furniture Bldg., Archts.

Ind., Evansville—B. W. Jenkins, 522 South 4th Ave., is having plans prepared for the construction of a 1 story, 40 x 100 ft. packing plant. Estimated cost $26,000. H. E. Boyle & Co., Furniture Bldg., Archts.

Ind., Fort Wayne—The Fort Wayne Box Co., Calhoun and Superior Sts., plans to build a box factory. Estimated cost $100,000. Architect not announced.

Ind., Indianapolis — The Amer. Tent & Awning Co., 632 South East St., awarded the contract for the construction of a 2 story, 72 x 112 ft. addition to its awning factory. Estimated cost $26,000.

Ind., Indianapolis — The Indianapolis Glove Co., Liberty and Michigan Sts., is having plans prepared for the construction of a 5 story, 100 x 160 ft. glove factory. Estimated cost $225,000. Rubush & Hunter, Amer. Central Life Bldg., Archts.

Ind., Indianapolis—The Kramer Realty Co., 315 North Garfield Ave., is having plans prepared for the construction of a 1 story, 80 x 240 ft. furniture factory, including 10 car garage and dry kiln, on English Ave. Estimated cost $35,000. R. N. Edwards, Union Trust Bldg., Engr.

Ind., Shelbyville—The Kennedy Paper Bag Co. is having plans prepared for the construction of a 1 story, 60 x 219 ft. paper bag factory. Estimated cost $27,000. Rubush & Hunter, Amer. Central Life Bldg., Indianapolis, Archts.

Ind., Sheridan—The Indiana Condensed Milk Co., 220 North Pennsylvania St., Indianapolis, is having plans prepared for the construction of a 2 story addition to its milk plant, here. Estimated cost $26,000. Private plans.

Ia., Dubuque—T. J. Mulgrew, Jones and Iona Sts., awarded the contract for the construction of an artificial ice and cold storage plant. Estimated cost $75,000.

Ia., Iowa City—The Economy Advertising Co. has purchased a site and plans to build a 2 or 3 story printing plant. Estimated cost $75,000. B. W. Mercer, Pres.

Ky., Louisville—The J. F. Kurfees Paint Co., 201 East Market St., plans to build a 5 story, 61 x 204 ft. addition to its plant. Estimated cost $200,000. Architect not announced.

Mass., Gardner — The Nichols Rattan Products Co., Main St., plans to build a 2 story, 90 x 140 ft. factory for the manufacture of chairs. Estimated cost $75,000. Private plans.

Mass., Gardner—The Standard Specialty Wks., Union St., will build a 1 story, 40 x 100 ft. factory for the manufacture of specialties. Estimated cost $25,000.

Mass., Medford—The Amer. Woolen Co., 245 State St., Boston, awarded the contract for the construction of a 5 story, 60 x 120 ft. addition to its factory on Boston Ave., here. Estimated cost $100,000.

Mass., South Hadley — The Holyoke Gummed Products Co., 9 Suffolk St., Holyoke, awarded the contract for the construction of a 1 story, 140 x 147 ft. gummed paper factory, here. Estimated cost $40,000.

Mass., Springfield—The Springfield Dairy System, 70 Ventura St., plans to build a bottling plant. Estimated cost $90,000. C. J. Grant, Clk.

Mass., Watertown—Vose & Sons Piano Co., 1010 Massachusetts Ave., Roxbury (Boston P. O.), awarded the contract for the construction of a 5 story, 80 x 220 ft. piano factory on School, Arsenal and North Beacon Sts., here. Estimated cost $300,000. Noted Oct. 19.

Mich., Grand Rapids — H. H. Turner, Archt., 923 Michigan Trust Bldg., is receiving bids until Jan. 10 for the construction of a 2 and 3 story, 85 x 178 ft. Junior High School, including manual training department, on Lee St., for the Bd. Educ. Estimated cost $150,000. H. Morrill, Business Mgr. Bd. Educ., City Hall.

N. J., Trenton—H. Entine, 163 Fair St., awarded the contract for the construction of a 2 story, 60 x 60 ft. burlap factory. Estimated cost $15,000.

N. Y., Jamaica—The Edward Langer Printing Co., Inc., awarded the contract for the construction of a 5 story, 120 x 280 ft. printing plant.

N. C., Charlotte—The H. M. Wade Mfg. Co., South Graham St., manufacturer of show cases and fixtures, is having plans prepared for the construction of a 4 story, 120 x 150 ft. factory. Estimated cost $150,000. Lockwood, Greene & Co., Piedmont Bldg., Archts.

N. C., Gastonia—The Ragan Spinning Co. plans to build a 10,000 spindle cotton mill. G. W. Ragan, Pres.

N. C., New Bern—The Rowland Lumber Co. plans to rebuild its mill which was recently destroyed by fire. Estimated cost $200,000. A. R. Turnbull, Pres.

O., Akron—The Miller Rubber Co., South High St., awarded the contract for the construction of 1 story, 75 x 125 ft. and 40 x 42 ft. factory buildings for the manufacture of rubber tires. Estimated cost $20,300.

O., Akron—W. Williams, 101-111 North High St., awarded the contract for the construction of a 2 story, 67 x 133 ft. soft drink bottling plant. Estimated cost $10,000.

O., Cleveland—The Peerless Paper Box Co., 3225 East 55th St., has had plans prepared for the construction of a 1 story, 59 x 140 ft. factory and warehouse at 3221 East 56th St. Estimated cost $40,000. P. Matzinger & Co., Caxton Bldg., Archts.

O., Cleveland—H. E. Roth, 1604 East 117th St., awarded the contract for the construction of a 1 story, 50 x 100 and 30 x 40 ft. hide house and garage on West 65th St. Estimated cost $40,000. Noted Dec. 14.

O., Lakewood (Cleveland P. O.) — The Cleveland Waterproof Paper Co., c/o A. Kennedy, Mgr., 2033 West 106th St., Cleveland, awarded the contract for the construction of a 1 story, 40 x 160 ft. factory, on Berea and Fischer Rds., here. Estimated cost $40,000.

O., Norwood (Cincinnati P. O.) — The Kemper-Thomas Co., Park Ave., manufacturer of calendars and advertising novelties, is having plans prepared for the construction of a 2 story, 60 x 200 ft. factory. Estimated cost $150,000. S. Hannaford & Sons, 1024 Dixie Terminal Bldg., Cincinnati, Archts.

Ore., Portland—The Port of Portland will soon receive bids for the construction of a hydro-cyanic acid fumigating plant, to fumigate cotton in bales, sacking, jute, plants, and other imported materials. Estimated cost $10,000. G. B. Hegardt, foot of Stark St., Ch. Engr.

Pa., Abington—Tilden & Register, Archts., 1525 Locust St., Phila., are receiving bids for the construction of a 2 story, 29 x 66 ft. heating plant and laundry, here, for the Abington Memorial Hospital, c/o J. B. Winder, Abington. Estimated cost $75,000.

Pa., Mount Jewett—The Safety Sled Co. plans to rebuild its factory which was recently destroyed by fire. Estimated cost $50,000. Architect not announced.

Pa., Phila.—The Crescent Textile & Supply Co., c/o W. Caldwell, Trenton and Susquehanna Aves., will soon receive bids for the construction of a 4 story card and textile factory on Trenton Ave. Estimated cost $100,000. W. H. Wooters, 816 West Allegheny Ave., Archt.

Pa., Phila.—The Pennsylvania Brick & Tile Co., c/o L. F. Ducker, Land Title Bldg., awarded the contract for the construction of a 1 and 2 story plant, capacity 150,000 brick per day, on Westmoreland St. and Delaware Ave. Estimated cost $100,000.

Pa., Phila.—S. F. Whitman & Sons, 4th and Race Sts., are having plans prepared for the construction of a 5 story candy factory. Estimated cost $250,000. W. Steele & Sons, 16th and Arch Sts., Archts.

Pa., Pittsburgh—J. M. McCollum, Archt., Berger Bldg., is receiving bids for the construction of a 3 story, 23 x 50 ft. publishing plant on 2nd Ave. and Grant St. for Smith Bros., Inc., 409 Grant St.

Pa., Pittsburgh—The Vitro Mfg. Co., 720 Bessemer Bldg., is having plans prepared for the construction of a 1 story, 32 x 45 ft. chemical factory at 600 Cliff St. Estimated cost $5,000. P. R. L. Hogner, 5th Ave. and 11th St., New Kensington, Archt.

Pa., Union City—A. L. Calfisch & Son Lumber Co. plans to rebuild portion of its saw mill which was destroyed by fire. Estimated cost $5,000. Architect not announced.

Pa., Warren—The Crew-Levick Co. plans to rebuild its oil filter plant, which was destroyed by fire. Estimated cost $40,000. Architect not announced.

Pa., Washington — Topliffe & Ely Co., manufacturer of toys, awarded the contract for the construction of a 3 story, 20 x 80 ft. factory on West End St. Estimated cost $100,000.

Tex., Pioneer—The Amer. Oil Co. plans to build a refinery, capacity 2,500 bbl. T. Ryan, Pres. Architect not announced.

Wash., Vancouver—U. McDonald, 315 Falling Bldg., Portland, Ore., Supt. of Western Lumber & Door Co., is building a planing mill, here. Estimated cost $50,000.

W. Va., Fairmont—The Imperial Ice Cream Co., Clarksburg, is having plans prepared for the construction of a 1 story, 50 x 120 ft. ice cream factory, including a 15 ton ice plant, on 5th St. and Virginia Ave., here. Estimated cost $15,000. Private plans.

Wis., Green Bay—The Press Gazette, 315 Cherry St., plans to build a 3 or 4 story plant. Estimated cost $100,000. Architect not selected.

Wis., Madison—The Madison Supply Co., 615 East Washington Ave., awarded the contract for the construction of a 2 story, 50 x 60 ft. bottling works and warehouse building. Noted Dec. 14.

Wis., Menasha—The John Strange Paper Pail Co. will build a 4 story, 60 x 100 ft. factory for the manufacture of paper pails. Estimated cost $50,000. J. Strange, Pres.

B. C., Prince George—The Aleza Lake Sawmill Co. plans to build a sawmill. Estimated cost $20,000. Architect not announced.

Ont., Hamilton—The Ontario Shale Brick Co., Sun Life Bldg., plans to build a plant. Estimated cost $100,000.

Ont., Petrolea — The Canadian Oil Co. plans to rebuild its plant which was partially destroyed by fire. Estimated cost $35,000. C. A. Hale, Mgr.

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American Machinist

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Ideals *plus* Ideas

TIME-HONORED custom makes this the open season for new resolutions, when each of us is wont to set a higher goal for next year's achievement.

But a new leaf thus blithely turned over has one fatal fault—it *doesn't always stick*. New Year's ideals, if not sustained by IDEAS, fade soon into the mist of the might-have-beens.

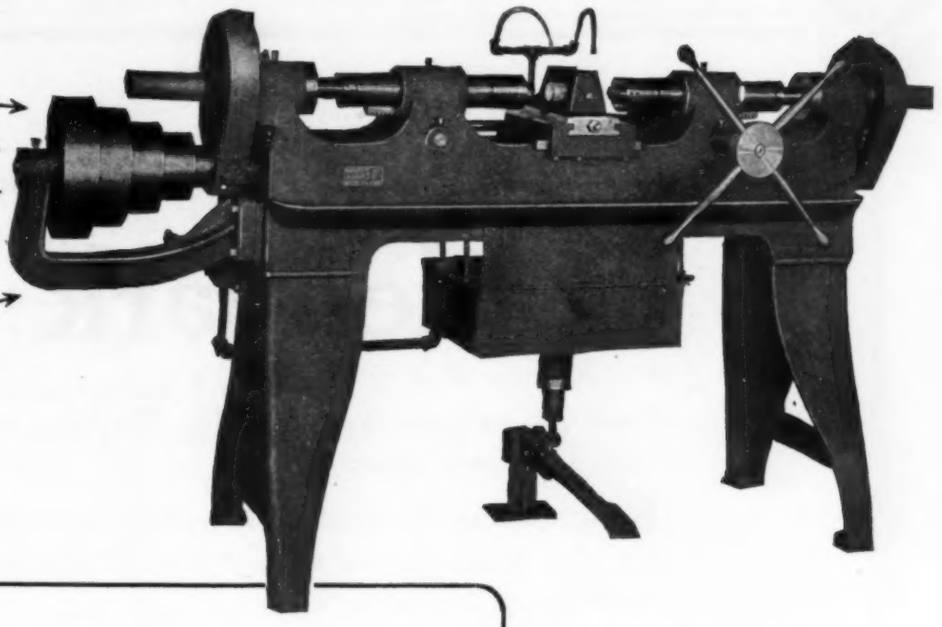
IDEAS—new ideas, better ideas and proved ideas—a wealth of ideas that will help readers of the *American Machinist* carry out their New Year's Ideals—are found each week in the advertising pages of the *American Machinist*.

IDEAS for the executives in every part of the metal-working manufacturing shop—facts about materials and equipment that will make a better product at a lower price—are waiting to be gleaned from the Buying Section. Here machinery executives who have resolved to raise production standards and reduce costs will get the essence of up-to-date practice—for the fact that a method or machine is advertised consistently is the best proof that it has made good.

So, after you have made your New Year's resolutions, make just one more in order to make the other ones stick. Resolve to make full use of the advertising pages of the *American Machinist*, where dependable ideas, proved and vouched for, are yours for the reading—because

Only Reliable Products
can be Continuously Advertised

Drills
Reams
Threads
Taps
Chamfers
both ends at once



Multi purpose machines are an asset these days

Competition of the kind to be met in manufacturing today demands that the cost of production be the minimum possible.

In attaining this objective multi-purpose machines are not only an asset but an actual necessity.

When you can get a machine that will perform any one or all of the five operations mentioned above more cheaply and in some cases better than the single-purpose machines that are necessary to do the same work, there should be no hesitation whatever in installing the machine.

Such a machine is the Murchey Double End Machine. And it is particularly productive where any or all of these operations are performed on both ends of the work, for it is arranged to complete both ends simultaneously.

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If you will send us samples of parts or prints we will give you cost and production estimates to prove it.

Murchey Machine & Tool Co.

953 Porter St., Detroit, Mich., U. S. A.

Cleveland Office, 6523 Euclid Avenue; Pittsburgh Representatives, Laughlin & Barney, Union Arcade Bldg.; Chicago Representatives, R. E. Ellis Engineering Co., 621 Washington Blvd.; Los Angeles Representatives, Smith-Booth-Usher Co., 228 Central Ave.; San Francisco, Smith-Booth-Usher Co., 50-60 Fremont St.; Coats Machine Tool Co., 14 Palmer St., Westminster, London, S. W., England; Fenwick, Freres & Company, 8 Rue de Rocroy, Paris.

MURCHEY Double End Machine

Speaking of—

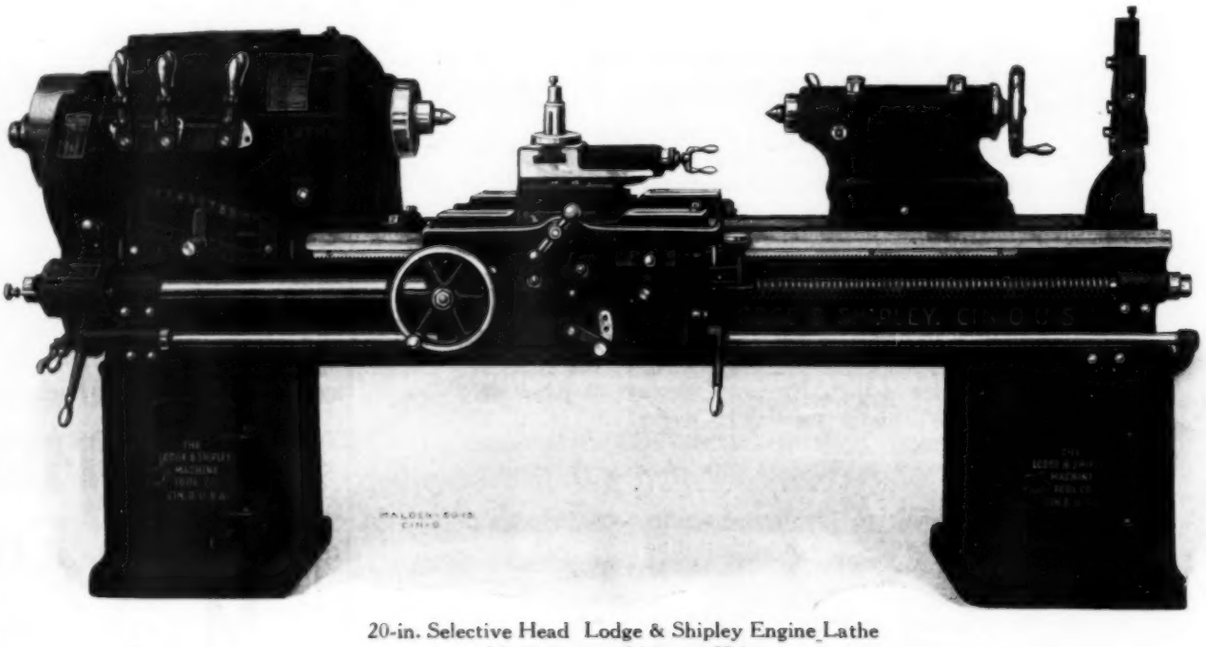
Trade mark

Years ago an apple was an apple. No more, no less. There were good apples and poor apples.

Today, look at the heights the humble apple has climbed! If you want one kind of apple you ask for one certain trade name and another for another.

And you get what you ask for!

Producers have realized that once they market fruit under a trade name, they must first select a good fruit and then be mighty careful to see that a high standard is maintained.



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Cincinnati

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The fact that Lodge & Shipley are today building lathes only, in accordance with their original ideas, means that the vision of thirty years ago, has been realized.

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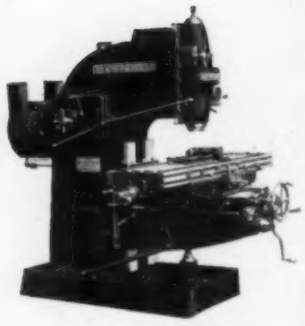

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Demonstration Room.
Complete line of our products in a running exhibit.
Operators' Instruction Sheets.

An Employees' Service Department
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Modern Employment Methods

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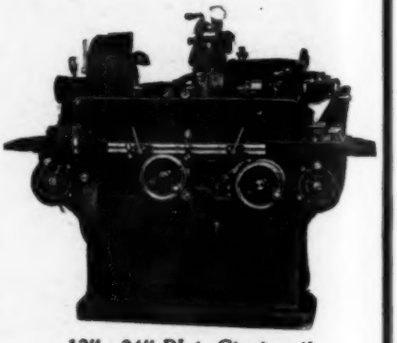
Co-operative Students of the University of Cincinnati at work.

Cincinnati Grinder Company's line of Cylindrical Grinders; in the process of manufacture and in demonstration.



12" x 24" Plain Cincinnati Cylindrical Grinder.

THE CINCINNATI GRINDER COMPANY

TO YOU IN 1923

Entering Our 39th Year

in the manufacture of

Milling Machines and Cutter Grinders

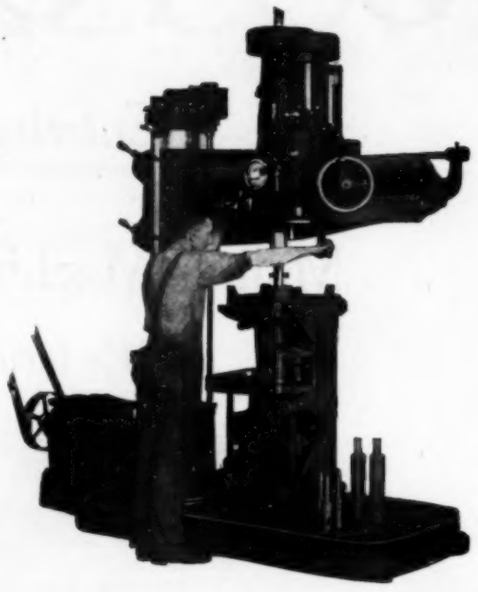
We invite you to visit our plant

THE CINCINNATI MILLING MACHINE CO.

THE CINCINNATI BICKFORD

4, 5 and 6 Foot Regular Plain Radial

One of the many highly desirable features of this machine is the location of its control levers. Maximum efficiency is unattainable without maximum convenience of operation. No back gears can be engaged without shock while the spindle is revolving at high speed. The driving clutch must be released sufficiently to permit slippage while the change is effected. The back gear lever should, therefore, be placed within easy reach of the reverse lever, so that the operator can keep a hand on each as depicted opposite.



The Cincinnati Bickford Tool Co.

Oakley, Cincinnati, Ohio, U. S. A.

Founded 1874

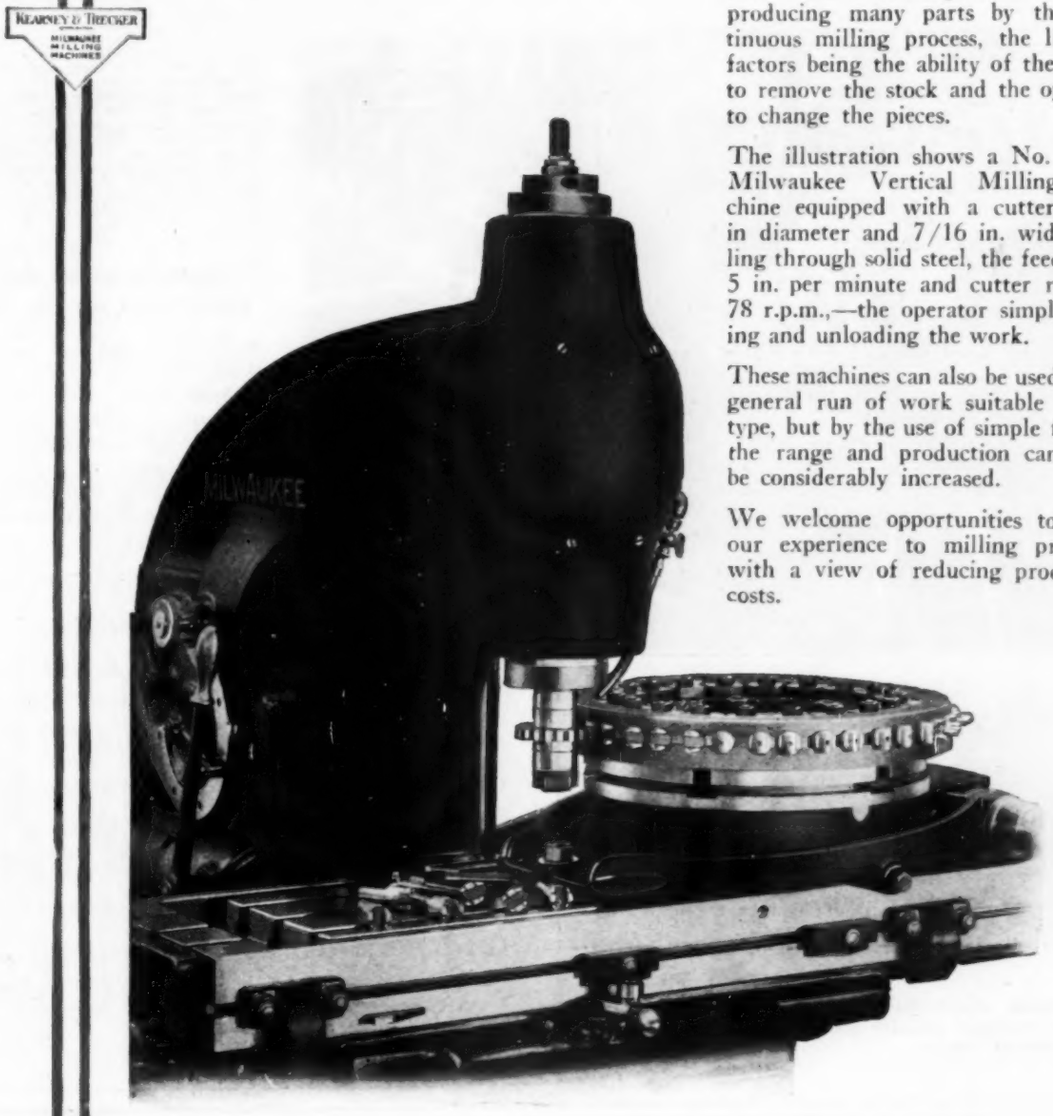
THE CINCINNATI

21-Inch Stationary Head Upright Drilling Machine

This illustration depicts the drill equipped with Back Gearing, Power Feed and Patented Tapping Attachment. The Back Gears increase the number of speeds from four to eight and multiply the pulling power of the spindle nearly five and one-half times. The tapping attachment acts through friction clutches and hence enables the operator to stop, start and reverse the spindle while the machine is running.

MILWAUKEE MILLING MACHINES

Continuous Milling on a Milwaukee Vertical

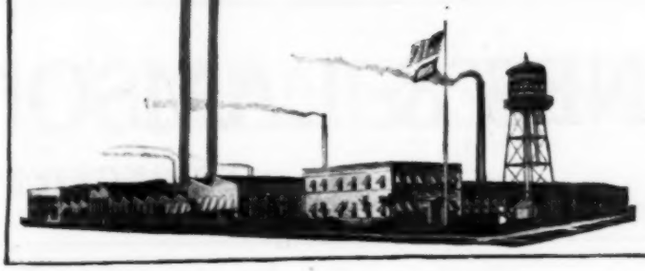


Milwaukee Vertical Milling Machines are well adapted for rapidly producing many parts by the continuous milling process, the limiting factors being the ability of the cutter to remove the stock and the operator to change the pieces.

The illustration shows a No. 1½-B Milwaukee Vertical Milling Machine equipped with a cutter 4 in. in diameter and 7/16 in. wide, milling through solid steel, the feed being 5 in. per minute and cutter running 78 r.p.m.,—the operator simply loading and unloading the work.

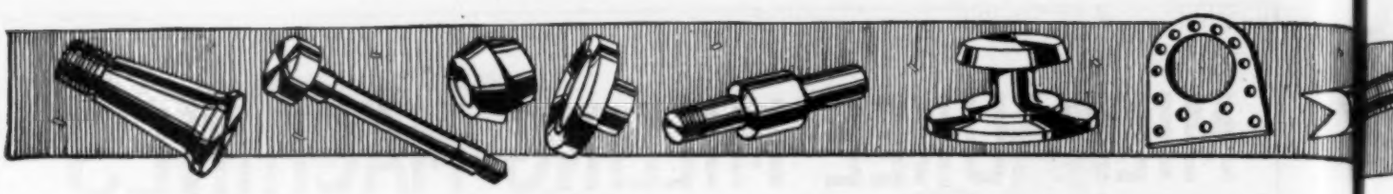
These machines can also be used on the general run of work suitable to this type, but by the use of simple fixtures the range and production can often be considerably increased.

We welcome opportunities to apply our experience to milling problems with a view of reducing production costs.

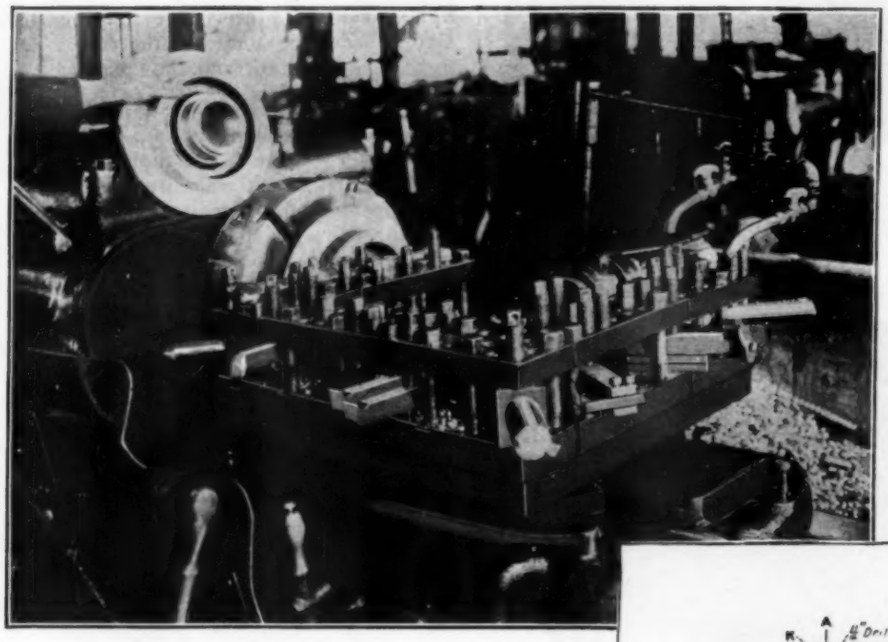


KEARNEY & TRECKER
CORPORATION
MILWAUKEE, WIS., U.S.A.

CHICAGO OFFICE 681 WASHINGTON BLVD. CLEVELAND OFFICE 738 SUPERIOR AVE. N.W. NEW YORK OFFICE 50 CHURCH STREET



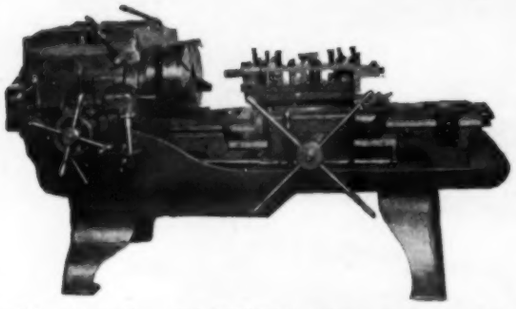
Versatility of the Hart
shown by many examp



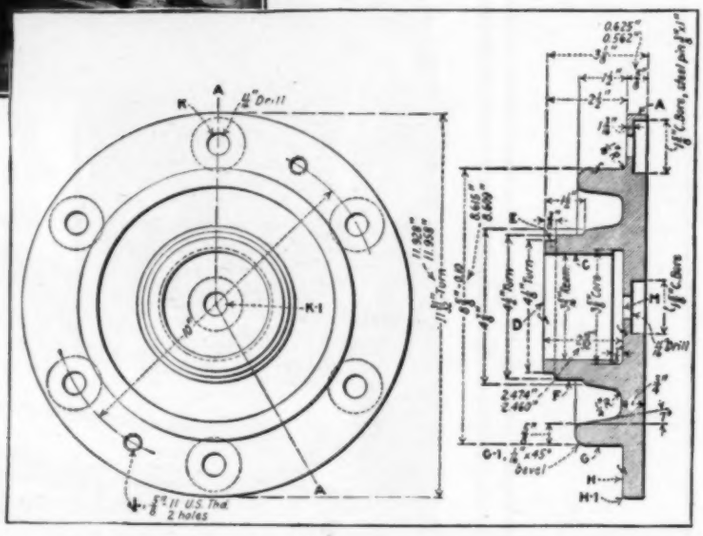
This is one of a series of examples taken from actual practice to illustrate the wide range in character of work of which the Hartness Flat Turret Lathe is capable, and its quick change possibilities from one job to the next. The examples are of parts being made on a commercial basis by a large manufacturer of mining machinery. They have 100 Hartness F. T. Lathes in their plant. Note the tools placed in the corners on this set-up. This gives 8 different positions instead of 4.

Operations on this piece performed on the Hartness

1. Turn A
2. Drill K-1
3. Rough bore C
4. Rough turn E, F and G
5. Rough face H, D and M
6. Finish bore C
7. Finish turn E, F, G and bevel G-1
8. Finish face H and D and bevel H-1.



Double Spindle HARTNESS Flat Turret Lathe equipped as a single spindle giving a 17 in. swing and 8 positions of turret.



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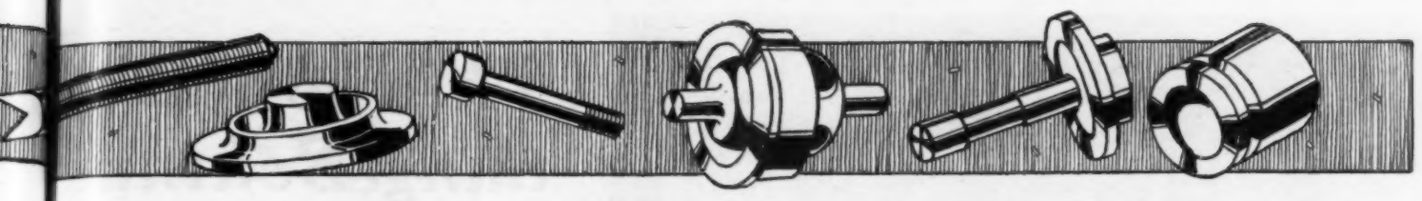

t ness Flat Turret Lathe
o les from actual practice

If your machines lack adaptability you must run the work through your plant in excessively large lots, or else you must have an unnecessarily large number of machines with, practically all the time, a certain percentage standing idle. This ties up a lot of your money where you derive no benefit from it and is a waste all around.

For quick adaptability to a great variety of jobs the Hartness Flat Turret Lathe is unexcelled. It has many exclusive features that contribute toward this result. Among others is the Cross Sliding Head.

The use of the Cross Sliding Head makes every turret tool a cross slide tool if necessary. The same tool can both bore and face, or turn and face.

The same tool can turn and bore two different diameters.

The same tool, if necessary, can face two different shoulders.

The same tool can feed forward or backward.

Nine stops for the cross sliding head, any or all of which may be applied to any one turret position, add to the flexibility of the general scheme.

The Hartness Flat Turret Lathe is the only lathe having a cross sliding head. All others must resort to a toolpost or to mounting the turret on two slides in order to get the same movements. Hence the "Hartness" is the only turret lathe having length and cross-feeds for each tool without resorting to the double-slide turret support.

This gives to the "Hartness" a versatility and adaptability with tool economy on both bar and chuck work that can not be equalled by any other turret lathe on the market.

Investigate this Hartness F. T. Lathe. It gives the largest output per dollar, as well as a low cost of work and an accurate duplication. Write today for complete details.

MACHINE COMPANY
VERMONT

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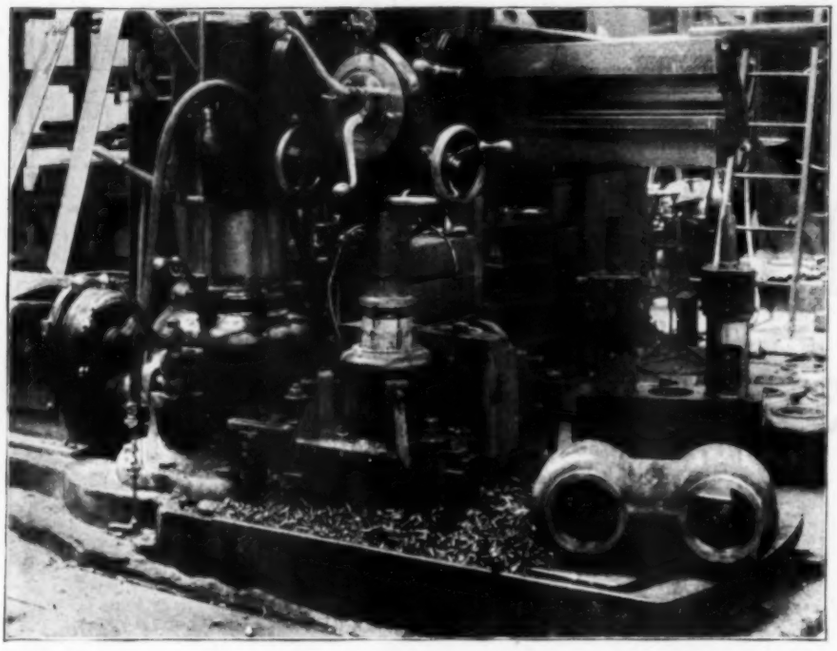
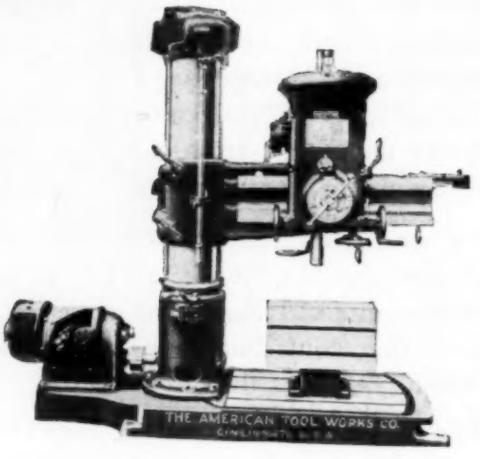
Sweden—A. Bol, Oscar Lindbom, Stockholm—Post Box 420



This Shows thing Behind "DO IT WITH

This 4-foot AMERICAN

Radial bores, faces and taps 6 in. holes in close-grained steel Time, 57 minutes



Probably there was some doubt as to results when Superintendent J. E. Dykstra, of the Foos Gas Engine Co., Springfield, Ohio, first put this 4-ft. "AMERICAN" Triple Purpose Radial Drill to the test, pictured above.

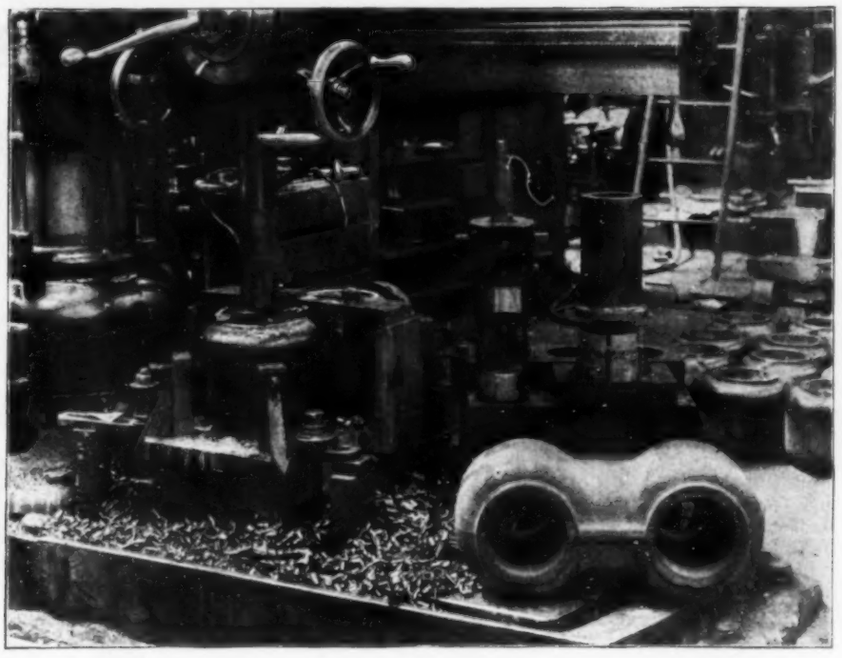
But it didn't take long for the wide-awake production executives in this shop to come to the conclusion that here was still another job where it paid to "do it with an AMERICAN."

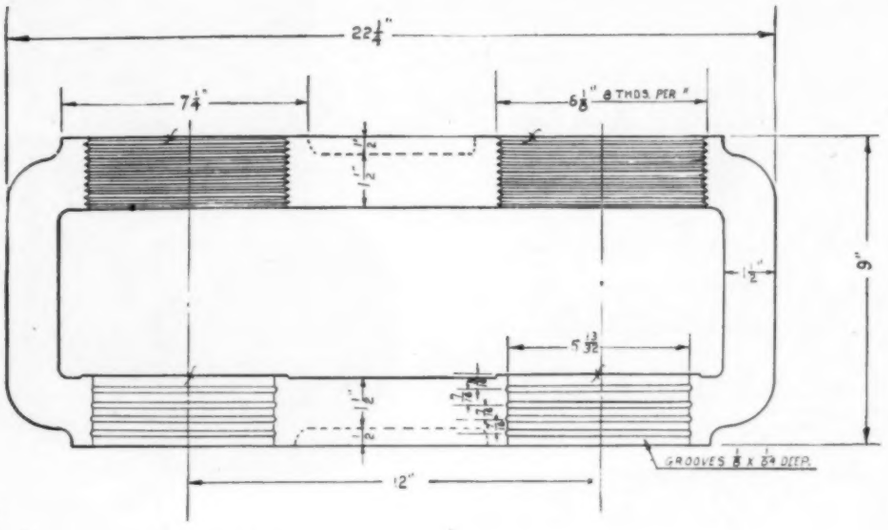
These castings of close-grained steel, capable of resisting a high pressure test, are rough and finished bored, faced and tapped. The production average, floor to floor, for the two 6-in. holes is 57 minutes. The extreme precision and reliability of the sturdy, adaptable "AMERICAN" eliminates spoilage. Out of 250 castings, 3 only were lost—and these due to a dull tap and hard spots in the castings.

THE AMERICAN TOOL WORKS

Lathes ***Planers***

There's Some-the Slogan— AN AMERICAN"!





The Secret

of the "American" Triple Purpose Radial Drill's remarkable success on boring and tapping jobs lies primarily in the internal gear spindle drive. The "American" is the only radial drill built that provides this feature, and consequently is pre-eminent on all work of that nature.

With the internal gear drive for boring and tapping, not only is there a smooth rolling contact between the gears, which imparts a smooth, steady action to the spindle, but there are a greater number of teeth in mesh than on the ordinary external gear drive; consequently, the spindle is held much more rigidly against chatter and vibration by the internal gear drive than it could possibly be held by an external drive. On our internal gear spindle drive there are three teeth constantly in mesh, while on the external gear drive, common to other designs, only one tooth is in mesh.

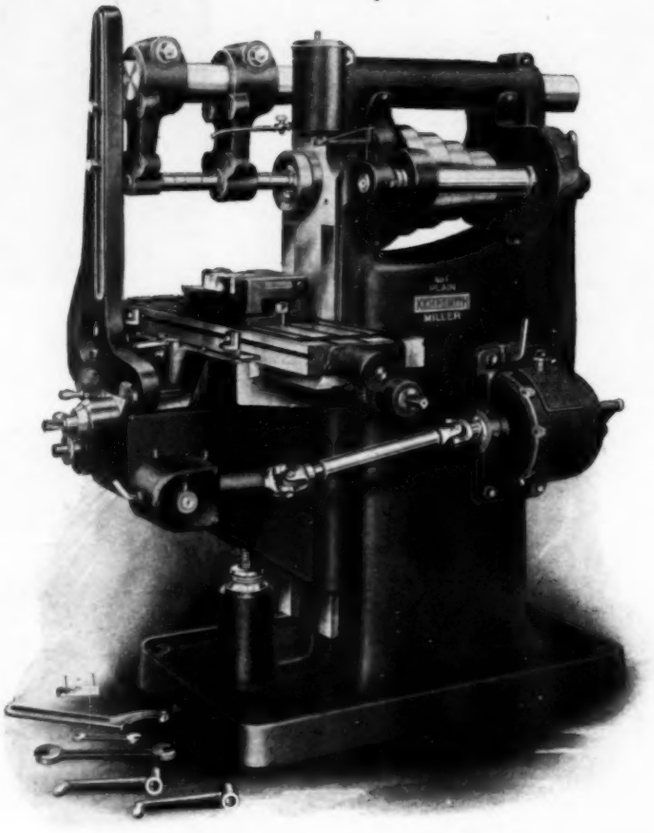
We build Radial Drills in sizes from 2 to 7 feet.

Probably you too can save big money on production by equipping to "Do it with an AMERICAN." At any rate, it's worth investigating. Let us go into the proposition with you.

COMPANY, CINCINNATI, U. S. A.

Shapers ***Radials***

Save Your Original Investment By Buying This



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Their Price is *RIGHT*

KEMPSMITH

THE KEMPSMITH MFG. CO
MILWAUKEE U.S.A.

The Maximum in Milling Machines

"tuff stuff"

Here's a job that demands the acme of precision on internal grinding. It is a Universal Joint Body and the material is Hard Steel.

Limits of .001 in. are held to on this piece and the .015-in. stock is removed in finishing. Twenty-five of these bodies are produced hourly. The Universal Products Company, where this work is being done, have 14 Heald Grinders. Such a battery is sufficient evidence of their value as producers, especially on this particular tough material.

Grind with a HEALD and be sure

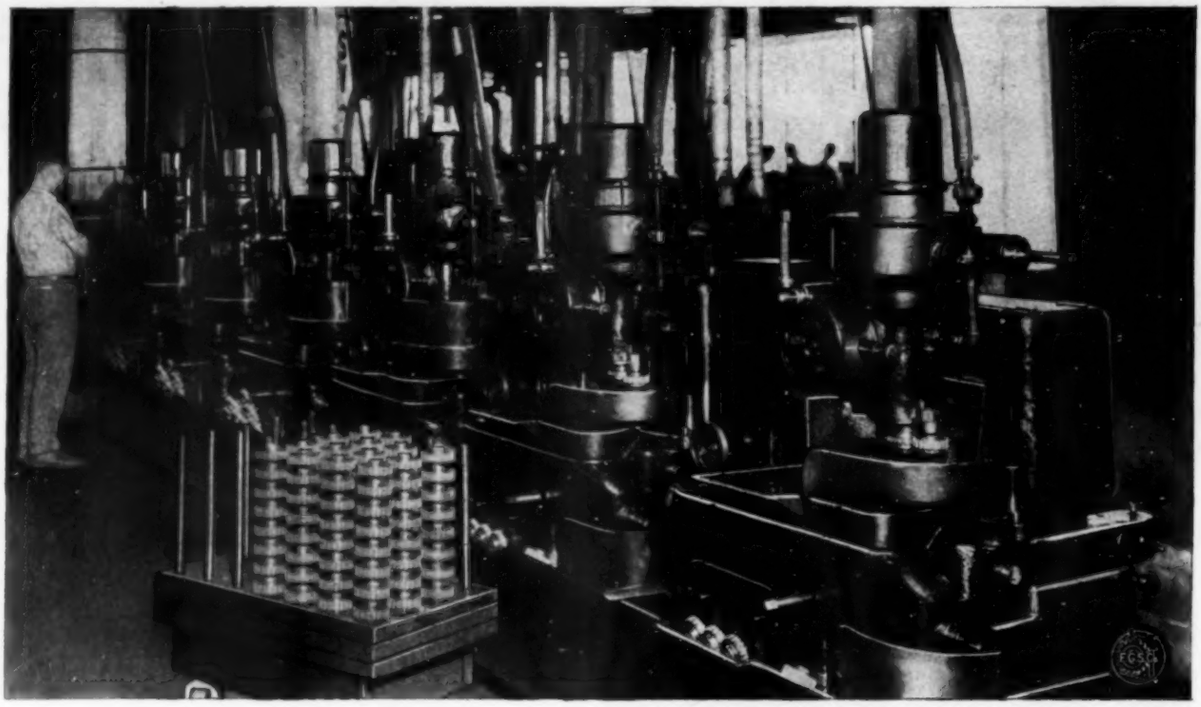
HEALD No. 75 Internal Grinder

is extremely rigid, durable and simple in construction. It is easily operated and fully guarded to protect the operator. It is particularly well adapted to handle such work as transmission gears, bevel gears, pinions, bushings, rings, etc., and on this short work will be found fully as rapid as any automatic feed machine.

Let Heald Engineers give you some performance facts and figures

THE HEALD MACHINE COMPANY

35 New Bond St., Worcester, Mass.



The New High-Speed Gear Shaper which is taking the place of Single-purpose Machines in many of the Large Automotive Factories

The Single-Purpose Machine is Taboo

A machine tool designed especially for performing one or more operations on a certain part may produce a greater number of pieces per hour than a so-called standard machine equipped with special fixtures.

But, when a change is made in the design of the part produced, what becomes of the single-purpose machine, unless it can be adapted to the new part?

The new High-speed Gear Shaper is a standard machine having single-purpose possibilities. To handle different pieces of work, it is only necessary to equip it with work arbors or work-holding fixtures suited to the work in hand. The machine in all of its functions and units is a standard product.

Works Managers in general are appreciating the significance of this fact and are adapting standard machines to single-purpose machine work.

Our book, "A New Development in Gear Cutting," explains wherein the new High-Speed Gear Shaper fulfills this important requirement.

Do you want a copy?

The Fellows Gear Shaper Company

Springfield, Vermont, U. S. A.

Foreign Agents: Alfred Herbert, Ltd., Coventry, England; Societe Anonyme Alfred Herbert, Paris, France; Societa Anonima Italiana Alfred Herbert, Milan, Italy; Alfred Herbert, Ltd., Yokohama, Japan; Societe Anonyme Belge Alfred Herbert, Brussels, Belgium; Alfred Herbert (India) Ltd., Head Office, Calcutta, India; J. Kamenicek & Co., Prague, Czecho-Slovakia; Bohm & Bormann, Berlin, Germany; Werkzeug-Und Maschinenfabriks-A.-G., Wemag, Wien, Austria.

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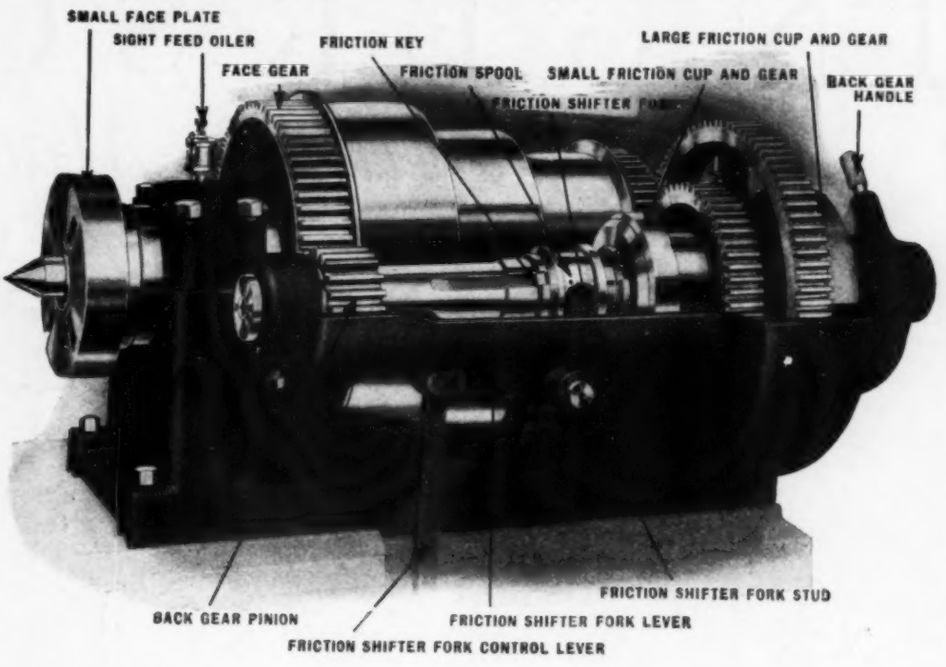
Change the Gears While Cut is Under Way

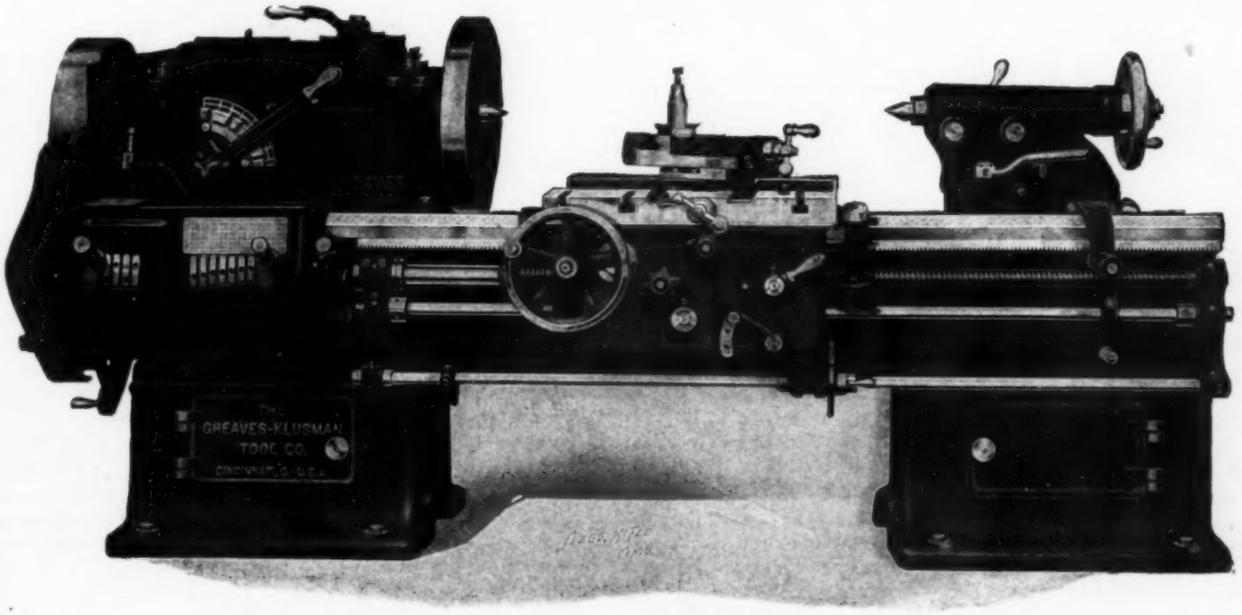


We show, herewith, a G-K feature that raises production figures by allowing the lathe operator to pay closer attention to his work. This Double Friction Back Gear is controlled from the apron and the lathe runner can quickly change the proper speeds while cut is progressing.

This Back Gear is self-adjusting, thus eliminating necessity of tightening it every few days. The ratio between the first and second back gears is the correct ratio between roughing and finishing speeds. This allows the operator to go directly from a roughing to a finishing cut. Six speeds are available without shifting drive belt.

G-K Heavy Duty Lathes are an assembly of features. Every unit entering into their construction is based on two prime factors—*quality* and *output*. The Catalog lists all the features but it will pay you to get it for full details on the

G-K Double Friction Back Gear

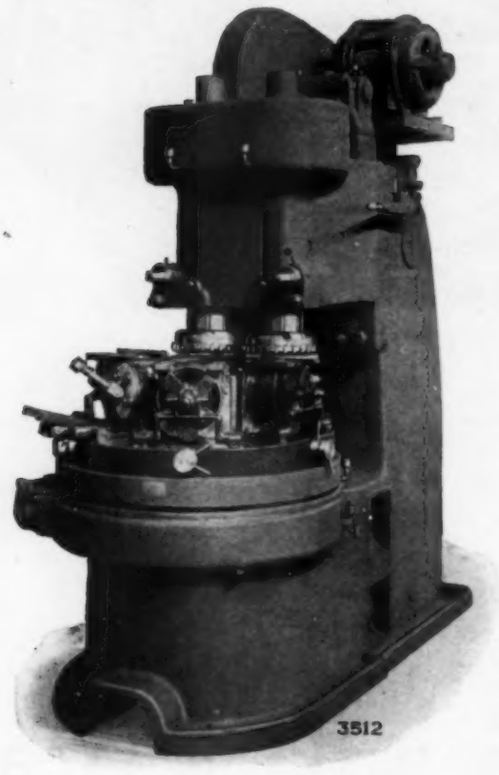


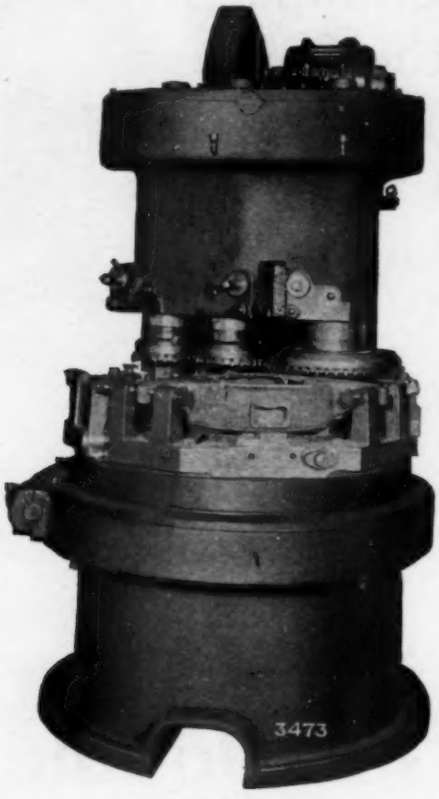
Greaves Klusman Tool Company

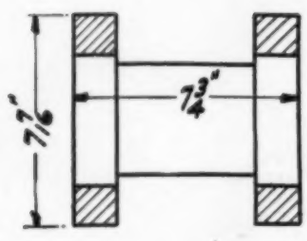
Cincinnati, Ohio, U. S. A.

INGERSOLL

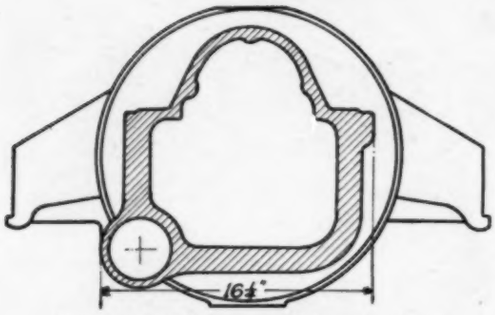
Rotary Milling Machines







Milling the feet of General Electric Motor Frames. A finished casting produced every minute.



Roughing and finishing flywheel housings for Continental Motors.

The development of the Ingersoll Rotary Continuous Milling Machine can be carried out so as to include a great many castings and forgings where the production requirements warrant continuous milling.

They occupy a very small amount of floor space and require only one operator, who merely removes the finished castings and replaces them with rough ones. This work can be done by one man without undue fatigue because the machine operates continuously, and without requiring his attention.

The cutters and fixtures with which these machines are equipped were designed and built in our shops and the entire responsibility for the installation was assumed by us.

In addition to building special machines adapted only for quantity production, we are prepared to build machines on which a large number of different operations can be performed, for shops having a diversified line of work going through in small quantities.

The Ingersoll Milling Machine Co.

Milling Machines and Their Equipment

Detroit: David Whitney Bldg. ROCKFORD, ILL. 50 Church St., New York

MULTI-DRILLERS NATCO MULTI-TAPPERS

No. 13 NATCO Tapping Water Pumps in Plant of Taber Pump Co., Buffalo, N. Y.

Size of spindles, 1 ¼ in.
Size of taps, ⅝ in.-16.
No. of holes tapped, 6.
Depth, ½ in.
Material, cast iron.
Speed, 365 R.P.M.
Actual tapping time, 5 sec.
Floor to floor, 17 sec.
Production, 212 per hour.

THE NATIONAL AUTOMATIC TOOL CO., Richmond, Ind., U.S.A.

Largest exclusive manufacturers of Multi-Drillers and Multi-Tappers

Automatically Milling

Further evidence of "No Delay" is shown in the illustrations on the opposite page, where two operations are being finished at the same time on the Potter & Johnston Automatic Milling Machine.

Fig. 1 and Fig. 2 show the operations performed.

Each table has a different fixture, each one applying to the operation as illustrated.

Each fixture holds four pieces.

The operator is loading the fixture on one table while the other table is feeding along, therefore no delay as the cutter is working practically all the time.

You must have work which can be arranged this same way, compare this with your present methods.

Send your Milling Problems to us and we will show you "How."

POTTER & JOHNSTON

Pawtucket, Rhode Island

Domestic Offices:

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Detroit Office: The Potter & Johnston Agency Co. 535 Bates St.

Chicago Office: 3057 Eastwood Ave. Leslie J. Orr, Manager.

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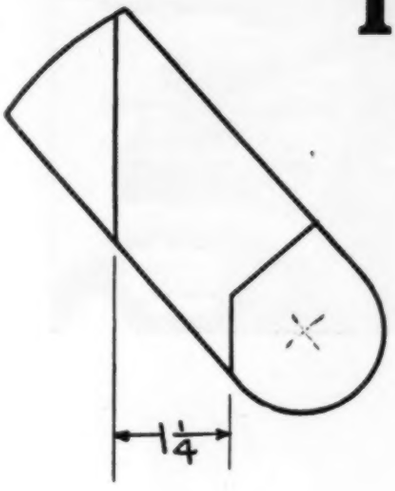
Charles Churchill & Co., Ltd., London, Birmingham, Manchester and Newcastle-on-Tyne, England and Glasgow, Scotland.

Ercole Vaghi, Corso Porta Nuova, 34 Milan, Italy.

Rylander & Asplund, Stockholm, Sweden.

Yamatake Company, No. 1 Yurakucho, Ichome Kojimachiku, Tokyo, Japan.

Two Operations at The Same Time



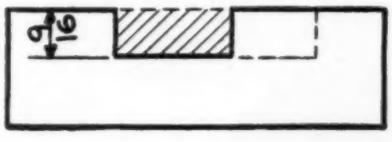


Fig. 1

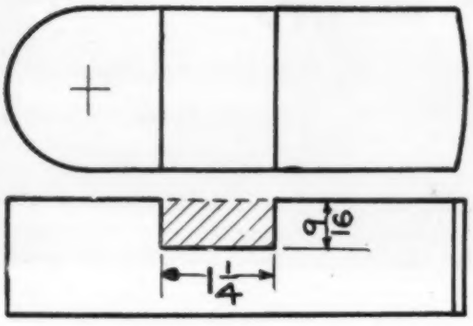
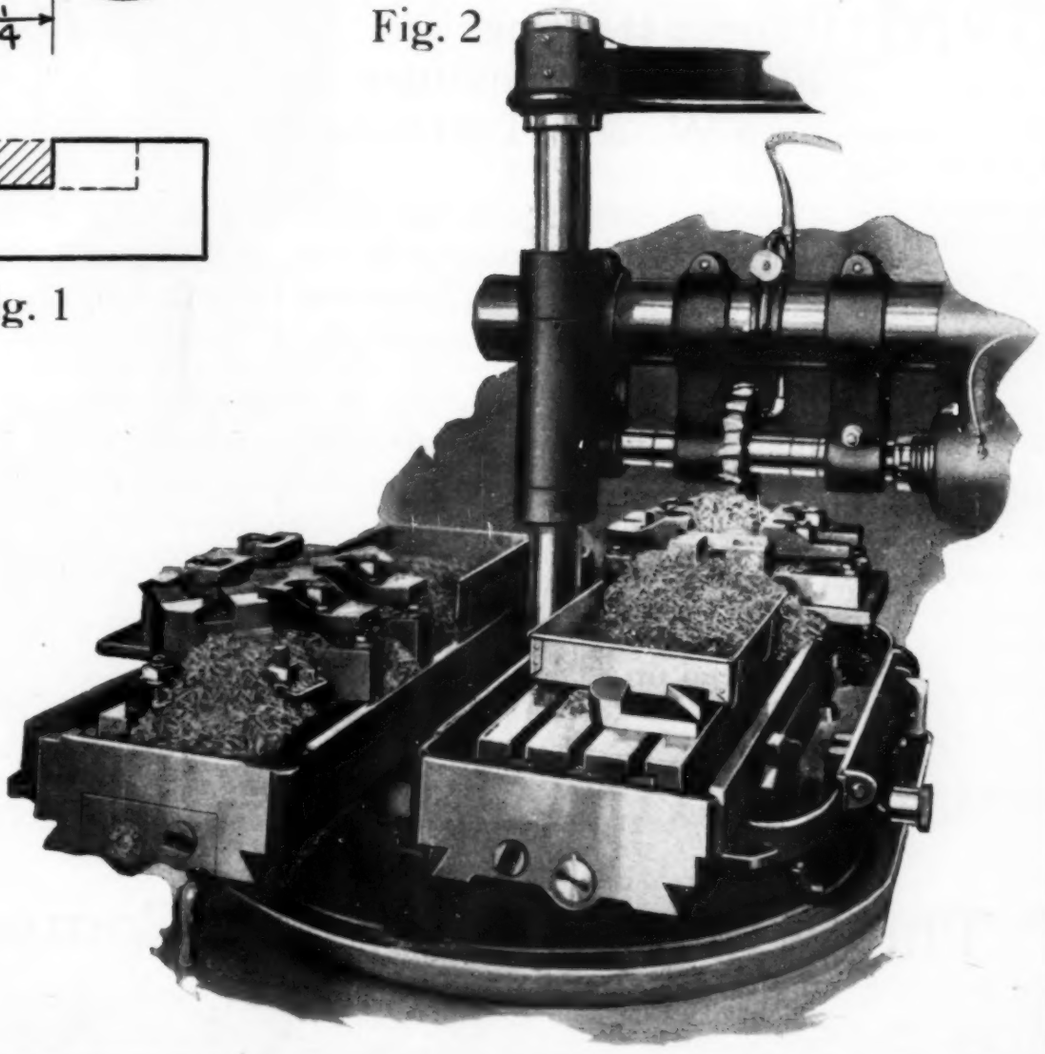
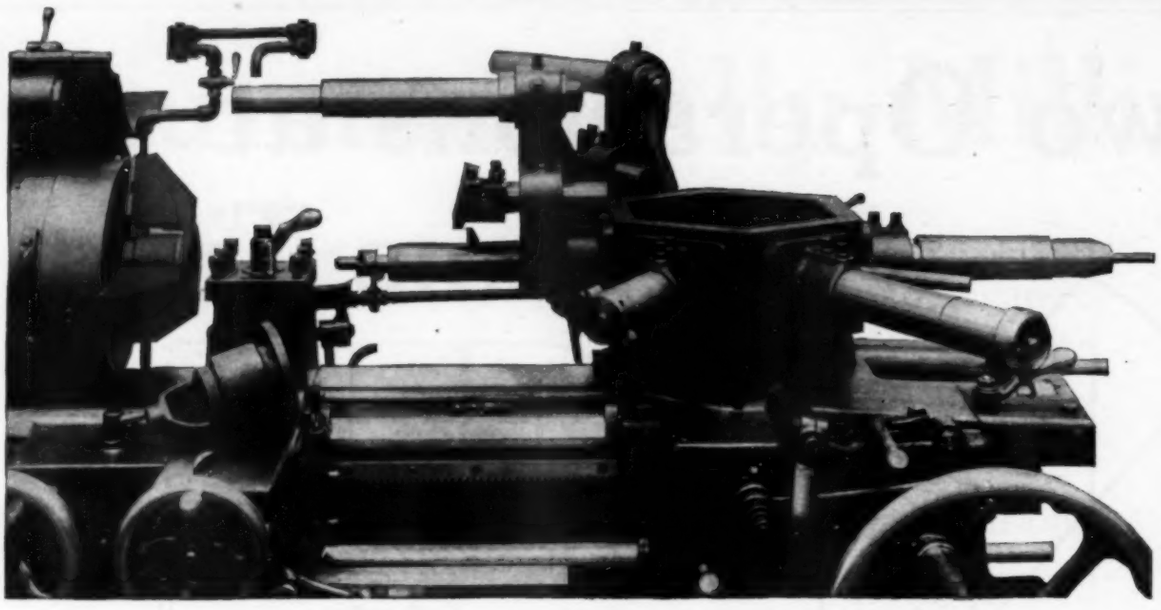


Fig. 2





Bendix Housings Finished in 3 minutes each on a W. & S. Turret Lathe

Overhead piloted tools can very often do your work to better advantage in cost, in accuracy and in finish. W. & S. Engineers recommended them in the job pictured above.

The very close accuracy to be obtained in the finish of these bendix housings demanded the use of this type tool, and the resulting time obtained (3 minutes each) quite justified their cost.

Have you some very accurate work you'd like to speed up? Send us blue prints of it.

Turret Lathes and Turret Lathe Tools ⅝ in. x 4 in. to 4½ in. x 44 in. Bar Capacity Up to 21½ in. Swing for Chucking Work.

The Warner & Swasey Company

Cleveland, U.S.A.

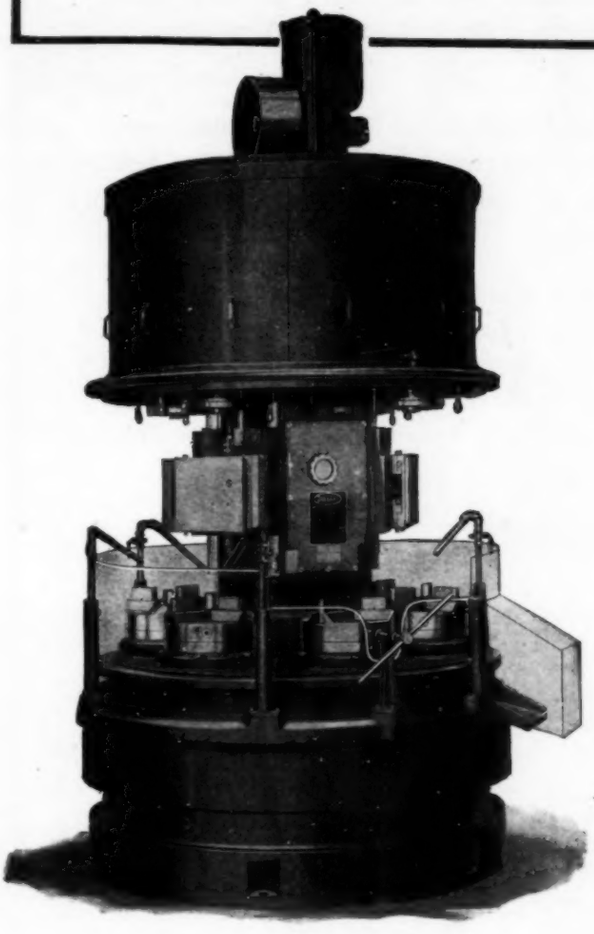
NEW YORK: Singer Building
CHICAGO: 618-622 Washington Boulevard
BOSTON: Oliver Building
MILWAUKEE: 209 Sycamore Building
DAYTON: 518 Mutual Home Building
BUFFALO: Iroquois Building
DETROIT: 5928 Second Boulevard

Mechanically Controlled Costs

The exactness of control and the elimination of waste motion insures against loss of machining seconds in the Bullard Mult-Au-Matic. Feeds and speeds are not guessed at. The time between cuts on series operation work is automatically controlled to the minimum.

THE

BULLARD



MULT-AU-MATIC

sets the pace and the operator merely chucks the blanks and removes the finished parts at the loading station. "The longest cut in the shortest time" is standard Mult-Au-Matic practice, so also is "Save all other tools"—for the shorter operations at other stations may be slowed down and the tool life lengthened proportionally.

Our files contain scores of reports showing Mult-Au-Matic savings.

On your chucked work the Mult-Au-Matic will save a large part of your direct and indirect costs. Our Engineering Service is yours to consult. Send us prints or samples of your chucked work for study and estimate.

The Bullard Machine Tool Company

Bridgeport, Conn., U.S.A.

Builders of the Mult-Au-Matic, the Vertical Turret Lathe and the Maxi-Mill.

BAUSH METAL
DURALUMIN

A Few Advantages

MACHINING

Better than aluminum.
Cost greatly reduced when compared with iron or steel.
Taps and threads well.

RECIPROCATING PARTS

Weight reduced without loss of strength.
Acceleration increased.
Inertia decreased.

Polishes easily.
Resists atmospheric conditions.
No plating required.

Can be rolled, forged, drawn, heat treated and annealed.
Hot and cold worked.

A QUALITY METAL

Duralumin is an alloy produced after years of systematic endeavor to meet the demand for a metal which shall be as light as Aluminum and as strong as mild steel, yet without the many disadvantages of Aluminum in its pure state.

Duralumin is the only light metal that can replace steel in forgings. With a two-thirds saving in weight, heat treated Duralumin Forgings approximate mild steel forgings in strength.

Wherever weight is a deciding factor Duralumin is the most satisfactory metal for most articles made by hot working or forging. Naturally, Duralumin Forgings are especially desirable for reciprocating or moving parts where inertia, due to their own weight, forms a large part of the total stress.

Minimum Physical Properties of Rolled or Sheet Metal (heat treated) and of Forging Metal are:

Tensile	55,000 lbs. per sq. inch
Elastic Limit	30,000 lbs. per sq. inch
Elongation	18%

BAUSH MACHINE TOOL COMPANY

Metals Division

SPRINGFIELD, MASS., U. S. A.

Manufacturers of

BAUSH
DURALUMIN

BLOOMS—SLABS—BILLETS—SHEETS—FORGINGS

BAUSH CASTING METAL INGOTS

Aluminum Alloy of High Tensile Strength

Rolling Mill and Drop Forge Works
SPRINGFIELD, MASS.

Detroit Office:
1825 Dime Savings Bank Bldg

What every purchasing agent and production engineer should know

about

UNION

High Power

Cutters

Why they require less driving power.

Why they last longer.

Why they do not get dull as quickly as other cutters.

Why they permit faster feeds.

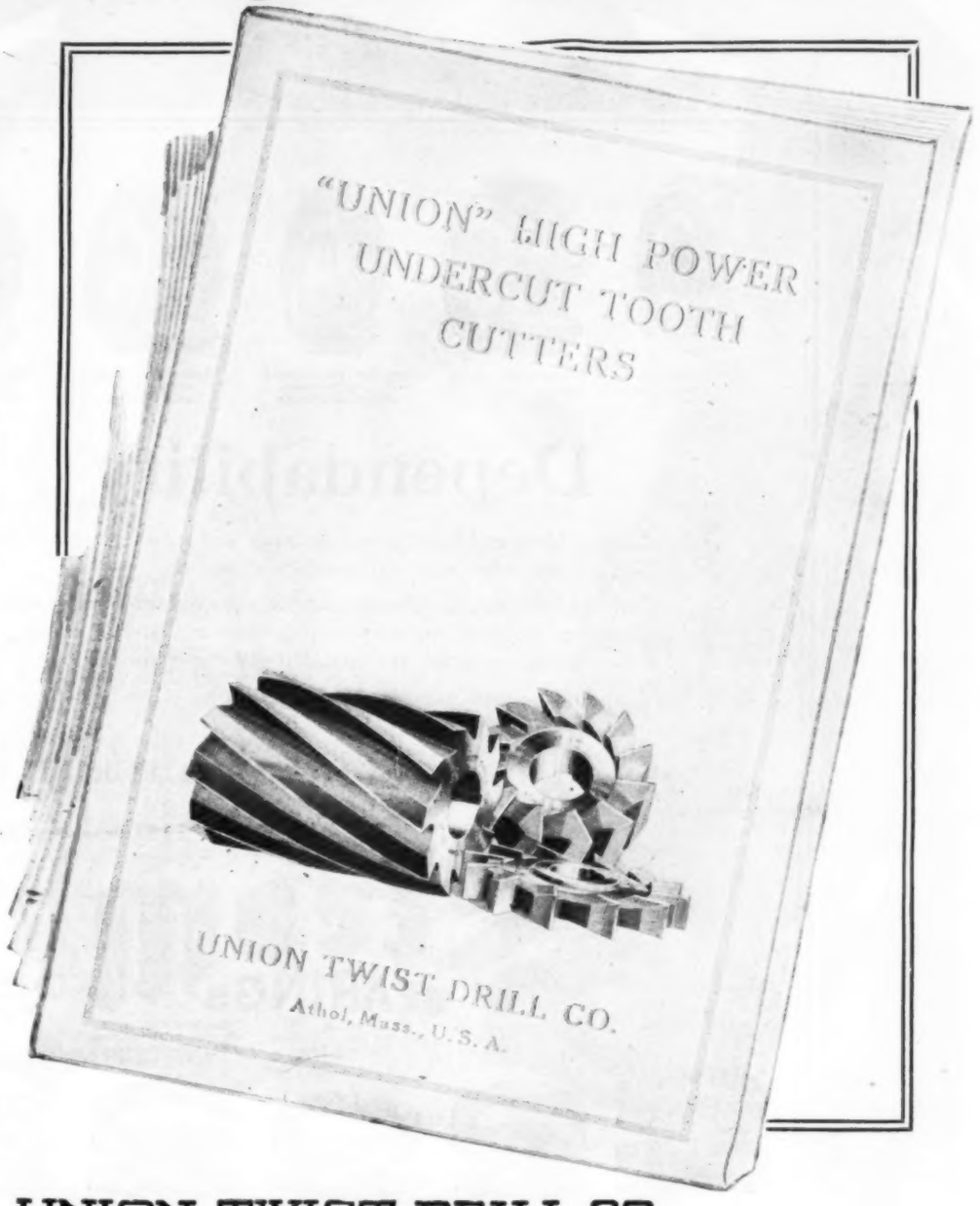
Why they reduce labor costs.

Why they increase your profits.

All of these reasons, and other valuable data are given in our new bulletin.

Every purchasing agent and production engineer should have a copy on his desk.

Write for one today.



UNION TWIST DRILL CO.

Drill, Reamer and Cutter Makers

ATHOL MASS. USA

New York **Chicago**

DOMESTIC AGENTS:

Buffalo—Root, Neal & Co. Cincinnati—V. N. Devou Supply Co. Cleveland—White Tool & Supply Co. Detroit—The Boyer Campbell Co. Evansville—Evansville Supply Co. Grand Rapids—McMullen Machinery Co. Indianapolis—Vonnegut Machinery Co. Milwaukee—The Philip Gross Hardware & Supply Co. Minneapolis—F. E. Satterlee Co. New Haven—The Page, Steel & Flagg Co. New Orleans—Oliver H. Van Horn Inc. (Cutters). Passaic—New Jersey Engineering & Supply Co. Philadelphia—E. M. Hanson & Co. Pittsburgh—Somers, Fitler & Todd Co. Rochester—Homer Strong & Co., Inc. San Francisco—Fred Ward & Son. Springfield—W. J. Foss Company. St. Louis—St. Louis Machinists' Supply Co. Syracuse—Syracuse Supply Co. Toledo—National Supply Co. Trenton—Warren Balderston & Co. Worcester—Brierly-Lombard Co.

FOREIGN AGENTS:

Australia—Bevan & Edwards, Ltd., Melbourne. Engineering Supply Company of Australia, Ltd., Brisbane. Belgium—Ateliers, Demoor, Brussels. China—Anderson Meyer, Shanghai. Denmark—V. Lowener, Copenhagen. England—Markt & Co., London. France—Société Aux Forges de Vulcain, Paris. Greece—A. M. Papasideris & Co. Italy—Chas. Civita, Milano. Spain—Hijo de Miguel Mateu, Barcelona. Norway—V. Lowener, Christiania. Sweden—V. Lowener, Stockholm.

Tools you buy again

Single-row deep-groove Conrad type, radial bearing

Double-row, deep-groove Conrad type, radial bearing

Angular contact bearing, combination radial and thrust

Double-row, maximum type, radial bearing

Single-row, maximum type, radial bearing

Dependability

Under unusual loads and high speeds, bearings will soon reveal whether or not they can be depended upon for satisfactory service.

Strom Bearings have met the demands of the most discriminating engineers. Their confidence is based on performance records, careful design, high-grade materials, and accurate workmanship of these bearings.

The Strom catalog contains sizes and load-carrying capacity data covering all standard bearings. You should have it on file.

U. S. BALL BEARING MANUFACTURING CO.

(*Conrad Patent Licensee*)

4530 Palmer Street **Chicago, Illinois**

Strom BEARINGS

Double-acting thrust bearing, flat seats (grooved races) 2100-F Series

Single-acting thrust bearing, flat seats (grooved races) 1100-F Series

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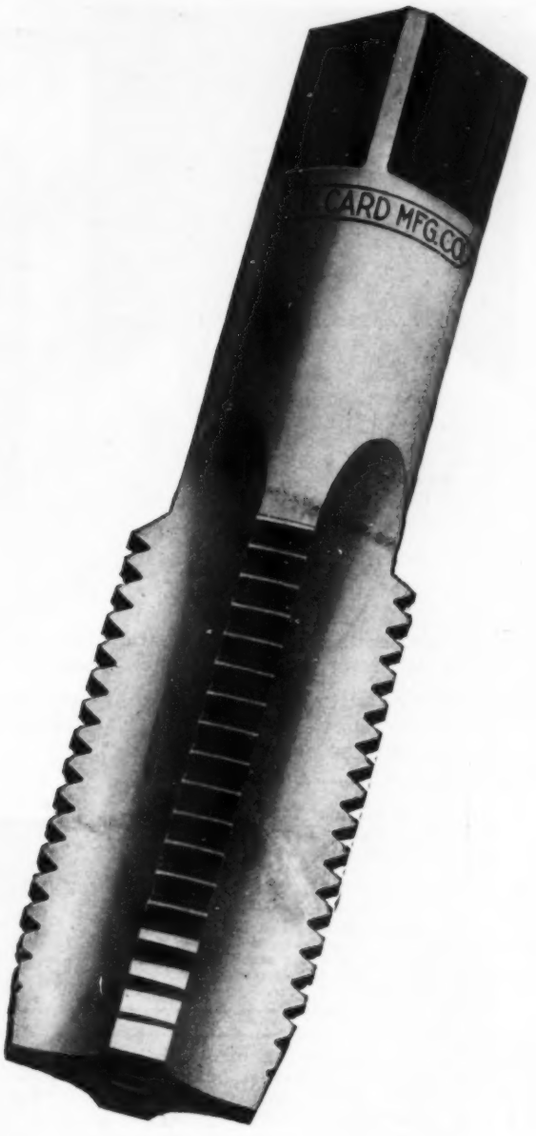
Double-acting, self-aligning thrust bearing, leveling washers 2100-U Series

Threading Tools of CARD Quality



May the New Year
be as successful
in every operation
in your plant, as
CARD Taps and Dies
can make it
in your thread cutting

The CARD Quality

S.W. CARD MFG. CO.

DIVISION OF UNION TWIST DRILL CO.

MANSFIELD, MASSACHUSETTS, U.S.A.

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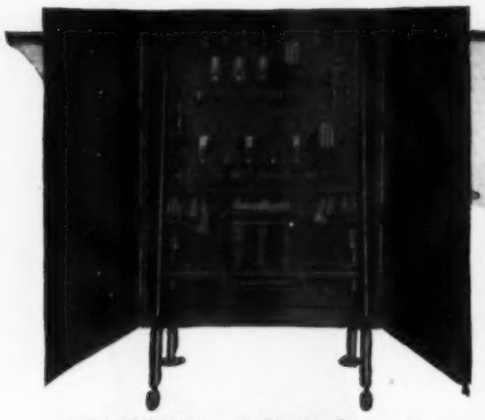
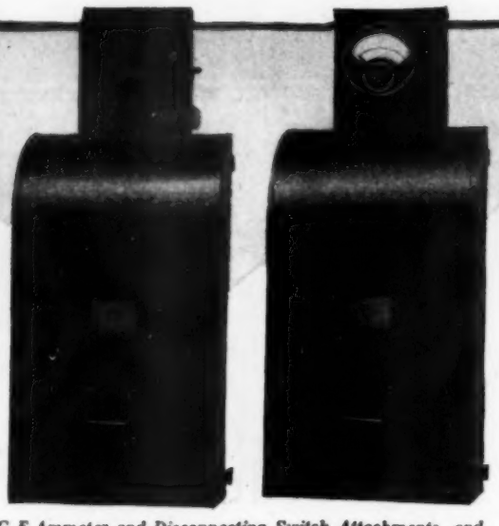
Automatic Starting Compensators for Squirrel Cage Induction Motors up to 600 Volts



G-E CR 7052 Automatic Starting Compensator—for floor mounting. For 3-phase 50- and 60-cycle motors 60 HP and larger, 220 V.; 125 HP and larger, 440 V.; 150 HP and larger, 550 V. For 3-phase 25-cycle motors 60 HP and larger, 220 V.; 100 HP and larger, 440 and 550 V. Minimum 2-phase ratings are somewhat different.



G-E Ammeter and Disconnecting Switch Attachments, and separable conduit wiring box of wall-type Compensator are designed with small knockout holes for convenient installation of either or both Attachments. These Attachments are for wall-type Compensators only.

G-E CR 7052 Automatic Starting Compensator—for wallmounting. For 3-phase 50- and 60-cycle motors up to 50 HP, 220 V.; 100 HP, 440 V.; 125 HP, 550 V. For 3-phase 25-cycle motors up to 50 HP, 220 V.; 75 HP, 440 and 550 V. Maximum 2-phase ratings are somewhat different. Equipped with separable conduit wiring box designed to be used with or without Ammeter Attachment or Disconnecting Switch.

Thousands of G-E Automatic Starting Compensators are used today because of their incomparable performance—and their flexibility of application for Industry's needs.

Their construction is such that they can be installed easily, inspected readily, and operated with convenience and economy. Enclosing cases for all live parts provide safety for operators, and prevent tampering by others.

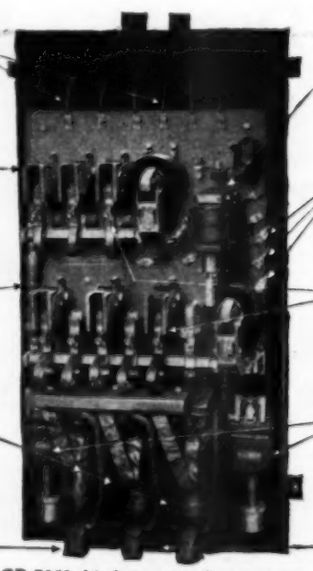
Terminals for motor and line leads. Liberal space for connections.

Contactors are suitable for severe service. They have solid copper tips, magnetic blowouts and moisture resisting coils, all accessible for easy inspection.

Fuse protects control circuit against accidental short-circuits when inspecting the equipment.

Three compensator coils for three phase give balanced starting conditions and maximum torque per ampere line current.

Accessible taps for selecting the most desirable starting voltage for any particular starting condition.



CR 7052-A1 Automatic Compensator with cover removed

Current limit relay automatically opens starting contactor and closes running contactor immediatly upon proper acceleration of the motor.

Terminals for control leads. Liberal space for running wires along edge of base to conduit wiring box.

Starting and running contactors open all lines to three-phase or two-phase three-wire motors.

Two inverse-time overload relays.

Padlock may be attached here to lock cover on.

General Electric Company

General Office Schenectady, N.Y.

Sales Offices in all large cities

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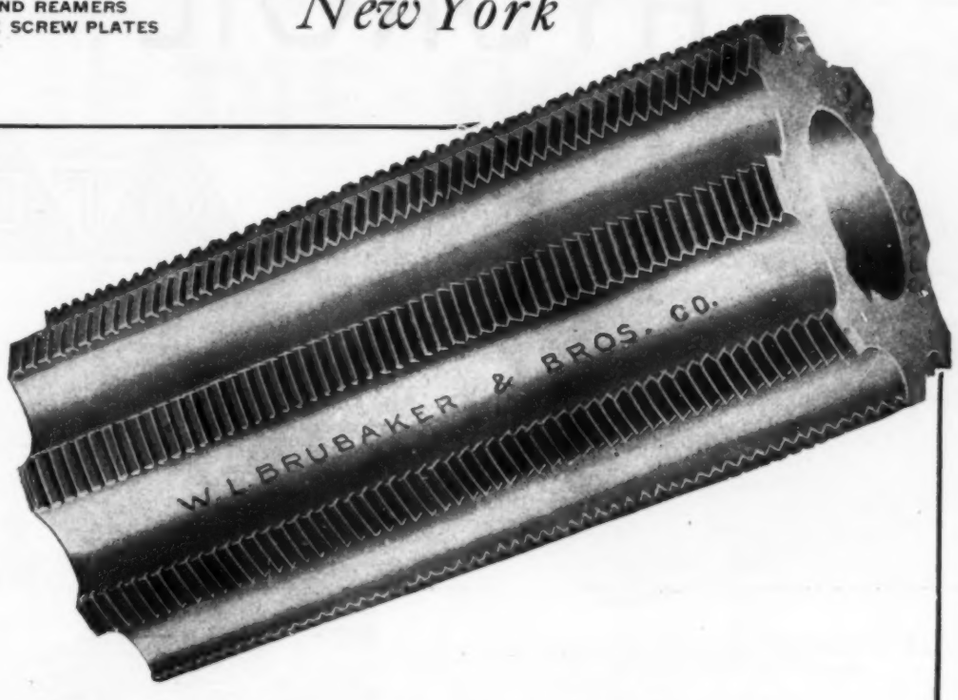
W. L. Brubaker & Bros. Co.

Hudson Terminal

50 Church Street

New York

MFRS.
TAPS, DIES AND REAMERS
COMMON SENSE SCREW PLATES



Readily Recognized

A good tool has something about it that causes its selection without hesitation. Clean-cut design, pleasing finish and an appearance of sturdiness are invariably backed by satisfactory service.

Brubaker Stay Tube Taps are the natural selection of the builders of Grade "A" boilers.

They are machined from the best grade of Tool Steel. Their Special Temper and Correct Relief assure free and easy cutting.

We can furnish these Taps in Carbon or High-Speed Steel when desired.

Let us give you some of the advantages derived from the use of

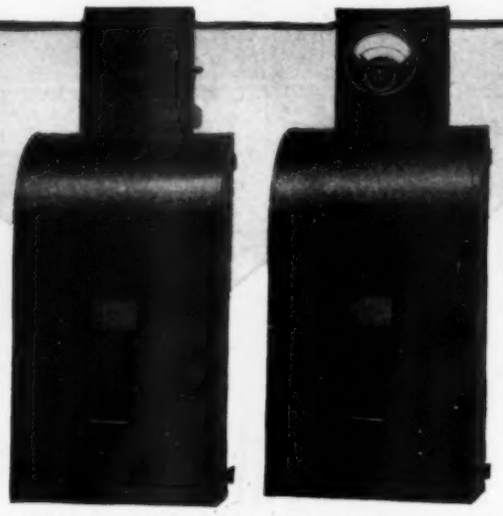
Stay Tube Taps

Any Sizes—Any Lengths—Furnished in 10 *days*

W. L. Brubaker & Bros. Co.
Factory at Millersburg, Pa.

Automatic Starting Compensators for Squirrel Cage Induction Motors up to 600 Volts

G-E CR 7052 Automatic Starting Compensator—for floor mounting. For 3-phase 50- and 60-cycle motors 60 HP and larger, 220 V.; 125 HP and larger, 440 V.; 150 HP and larger, 550 V. For 3-phase 25-cycle motors 60 HP and larger, 220 V.; 100 HP and larger, 440 and 550 V. Minimum 2-phase ratings are somewhat different.



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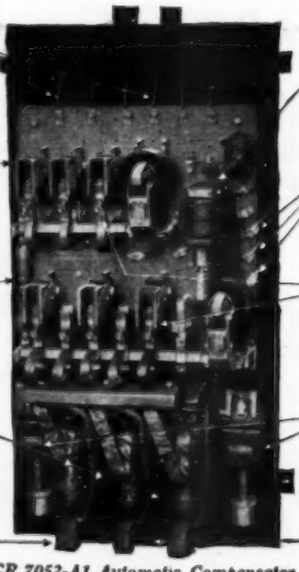
Terminals for motor and line leads. Liberal space for connections.

Contactors are suitable for severe service. They have solid copper tips, magnetic blowouts and moisture resisting coils, all accessible for easy inspection.

Fuse protects control circuit against accidental short-circuits when inspecting the equipment.

Three compensator coils for three phase give balanced starting conditions and maximum torque per ampere line current.

Accessible taps for selecting the most desirable starting voltage for any particular starting condition.



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General Electric Company

General Office Schenectady, N.Y.

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TAPS, DIES AND REAMERS
COMMON SENSE SCREW PLATES

Readily Recognized

A good tool has something about it that causes its selection without hesitation. Clean-cut design, pleasing finish and an appearance of sturdiness are invariably backed by satisfactory service.

Brubaker Stay Tube Taps are the natural selection of the builders of Grade "A" boilers.

They are machined from the best grade of Tool Steel. Their Special Temper and Correct Relief assure free and easy cutting.

We can furnish these Taps in Carbon or High-Speed Steel when desired.

Let us give you some of the advantages derived from the use of

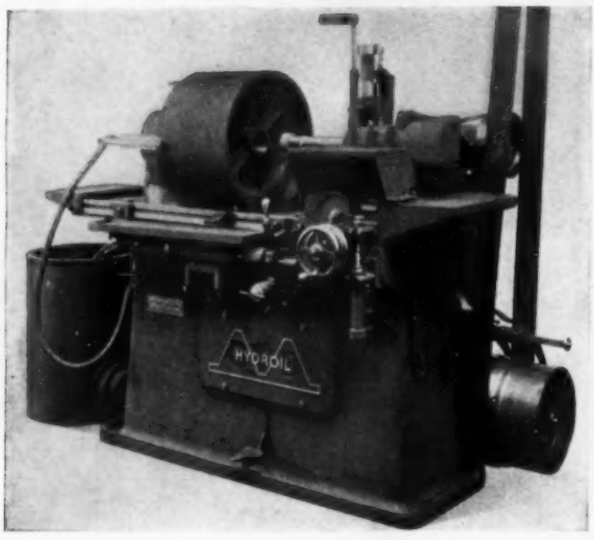
Stay Tube Taps

Any Sizes—Any Lengths—Furnished in 10 days

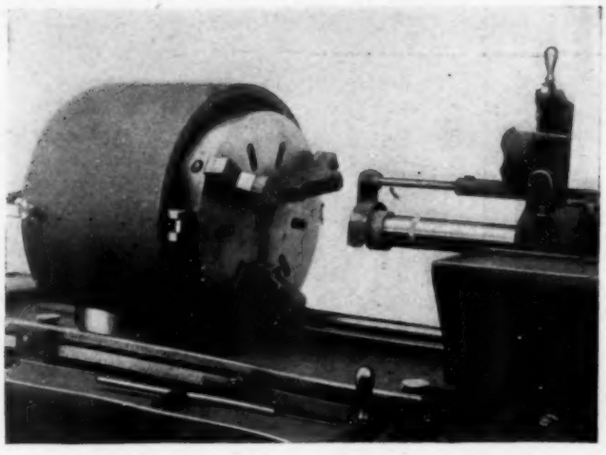
W. L. Brubaker & Bros. Co.
Factory at Millersburg, Pa.

Little Stories of Real Production

Grinding Manganese Steel with "HYDROIL"



No. 52 "HYDROIL" equipped to grind 20-in. manganese steel sheaves.



Showing heavy chuck, blocked up work head and arrangement of wheel slide and water guard.

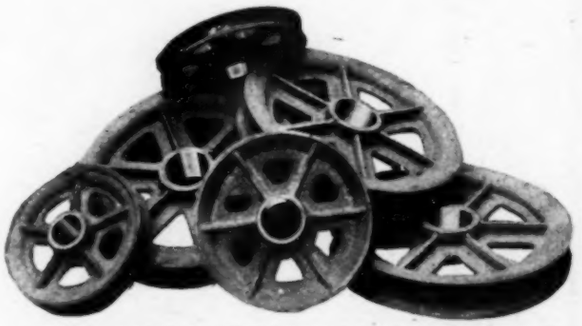
This was a job they all said was "wicked"

Sheaves for carrying mine cables must be made of the toughest material, to resist the eternal wear of grease and grit-coated cables. Manganese steel is used extensively because of its extreme toughness.

Once the center hole was finished in a lathe, and it was not uncommon to spend a whole day on one large sheave. "*Hydroil*" has taken hold of the job and put it on a production basis. They figure time in minutes instead of hours now.

A No. 52 "*Hydroil*" was provided with a raising block and special wheel slide to care for the large sheaves. (They are 20 in. in diameter.) The center hole is 3½ in. diameter and 4 in. deep and the average stock removed is .060 in.

Have you a tough job? The "*Hydroil*" Grinder may be just what you are looking for. Write for description and data covering this machine.



12 in. and 20 in. O.D. manganese steel sheaves internally ground on No. 52 "HYDROIL" Grinder.

The "HYDROIL" will be shown in action at the New York Auto Show, January 6-13 inclusive. Call at Booth No. C-5D Grand Central Palace

GREENFIELD TAP AND DIE CORPORATION
GREENFIELD, MASSACHUSETTS

DOEHLER

The World's Largest Producer of

DIE-CASTINGS

It would be folly for any producer of die-castings to claim 100 per cent perfection for his product. So long as the human element is a factor in the making of die-castings, errors will creep in. And such errors can be minimized only by creating — in the producer's organization — an "esprit du corps"— under which each man feels a personal responsibility for the maintenance of a standard. The Doehler policy is to make every man in the Doehler organization feel that he is a vital factor in the success of the company — a success built on a basis of quality in die-castings and a success that can be maintained only by maintaining the standards of metal quality, accuracy and finish which have made Doehler the world's largest producer of die-castings.

DOEHLER DIE-CASTING CO.
BROOKLYN. N.Y.
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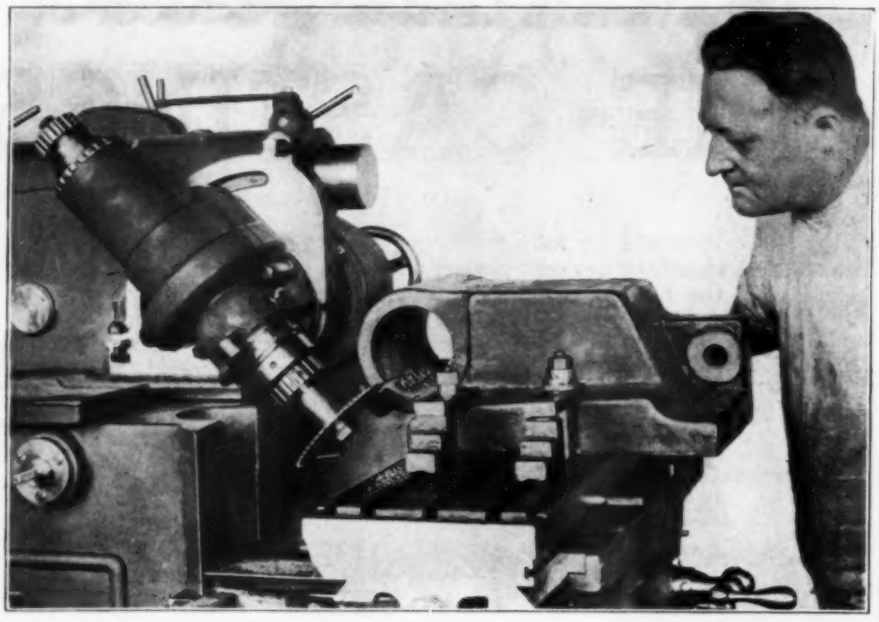
Doehler die-cast parts for electrical devices and radio apparatus

This Job Will Be All Finished on a VAN NORMAN "DUPLEX" While You Are Rigging-It-Up on Another Miller



No Special Fixtures Required

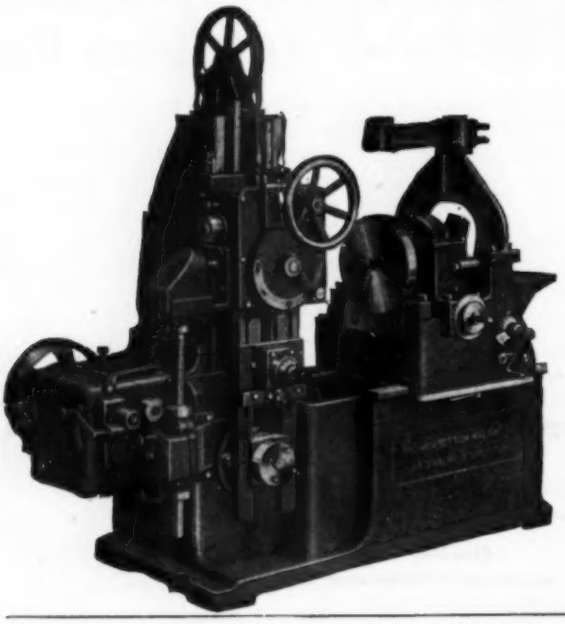
Just Clamp It Flat on the Table

Universal in Range

Requires Minimum Equipment

Van Norman Machine Tool Co.
160 Wilbraham Avenue
Springfield, Mass., U. S. A.

Machine Finish Insures Precision



Hand work seldom results in rigid duplication. In finishing cams by hand, the slight variations from limits cause irregular machine movements.

Rowbottom Cams are a machine made product in their entirety. Every cam produced is an exact duplicate of the master.

The **Rowbottom Universal Cam Milling Machine** was developed to produce cams of every required type on a commercial basis. It produces with the acme of precision at low cost.

If your needs do not warrant the installation of a **Rowbottom** machine, we can cut your cams for you.

In either case you get the peak in cam performance.

The Rowbottom Machine Co.
Waterbury, Conn.
Factory: Waterville, Conn.

Rowbottom for Cams

No. 4

OF A SERIES OF ARTICLES PICTURING THE INFLUENCE OF THE ENGINEER IN THE AFFAIRS OF THE WORLD. PRESENTED BY THE McGRAW-HILL COMPANY, INC., WHOSE PUBLICATIONS HAVE SERVED THE ENGINEER THROUGH HALF A CENTURY OF INDUSTRIAL PROGRESS

THE BREADTH OF ECONOMICS

AN old word with a new meaning has been introduced into the affairs of men. The power of words is very great and an understanding of them is one of the essentials to progress.

¶ The advancement of humanity hinges, to an almost menacing extent, upon a complete conception of the word *economics*. Once popularly confined to finance, it has grown to involve the whole realm of human activity.

¶ Now man is the economic factor in the work of the world. Whatever he does, the result—time, effort, ability and resources engaged—must prove up under the standards of economics, or be judged unworthy.

¶ But who has brought about this change, this revision in the conception of man's advancement, of man's inevitable responsibility? And who has given this word so vast a power over human destinies and has caused so gigantic a revolution for the benefit of all humanity?

¶ The engineer. His is the responsibility. He it is who has introduced economics into all the affairs of men. He it is who has provided the world with a new basis for judgment and appreciation.

¶ The engineer, who has made life assume a scientific instead of a chaotic aspect; who has developed an exactness of procedure; who has worked out cause and effect on a calculable basis; who is even now reducing the fever of misapplication of life's priceless energies and putting them to the service of constructive happiness.

¶ It will be many generations before the mass of humanity knows and acknowledges its debt to the engineer, who so quietly brings about such stupendous revolutions and revelations, and who takes the past and links it to the present for the benefit of the future.

¶ Yet while the acknowledgment may be long in coming, the engineer has his reward in the knowledge of work well done, in the joy of accomplishment, in the feeling of power which gives him the opportunity to direct the courses of men even before they are aware of the source of authority.

Coal Age

Electrical World

Electrical Merchandising

American Machinist

Industrial Engineer (Published in Chicago)

Engineering and Mining Journal-Press

American Machinist European Edition (London)

Power

Engineering News-Record

Bus Transportation

Electric Railway Journal

Ingenieria Internacional (Printed in Spanish)

Chemical and Metallurgical Engineering

Journal of Electricity and Western Industry (San Francisco)

McGRAW-HILL COMPANY · INC ·

NEW YORK

FROM GILBERT'S

DE MAGNETE —

"WORD MONGERS" *and* "CHATTERING BARBERS"

"Word mongers" and "chattering barbers," Gilbert called those of his predecessors who asserted that a wound made by a magnetized needle was painless, that a magnet will attract silver, that the diamond will draw iron, that the magnet thirsts and dies in the absence of iron, that a magnet, pulverized and taken with sweetened water, will cure headaches and prevent fat.

Before Gilbert died in 1603, he had done much to explain magnetism and electricity through experiment. He found that by hammering iron held in a magnetic meridian it can be magnetized. He discovered that the compass needle is controlled by the earth's magnetism and that one magnet can remagnetize another that has lost its power. He noted the common electrical attraction of rubbed bodies, among them diamonds, as well as glass, crystals, and stones, and was the first to study electricity as a distinct force.

"Not in books, but in things themselves, look for knowledge," he shouted. This man helped to revolutionize methods of thinking—helped to make electricity what it has become. His fellow men were little concerned with him and his experiments. "Will Queen Elizabeth marry—and whom?" they were asking.

Elizabeth's flirtations mean little to us. Gilbert's method means much. It is the method that has made modern electricity what it has become, the method which enabled the Research Laboratories of the General Electric Company to discover new electrical principles now applied in transmitting power for hundreds of miles, in lighting homes electrically, in aiding physicians with the X-rays, in freeing civilization from drudgery.

General Electric Company

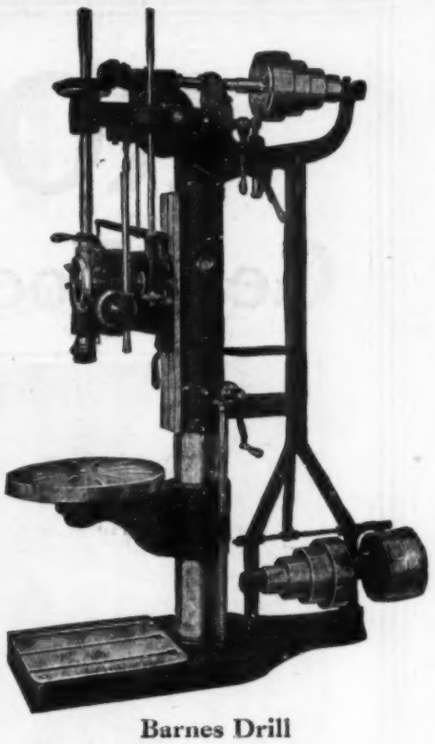
General Office *Schenectady, N.Y.*

95-824 H. D.

Complete Line of 8 inch to 50 inch Swing (with or without Tapping Attachment)

Upright DRILLS
Horizontal DRILLS
Gang DRILLS

Convenience of Operation
Accuracy—Strength



Barnes Drill

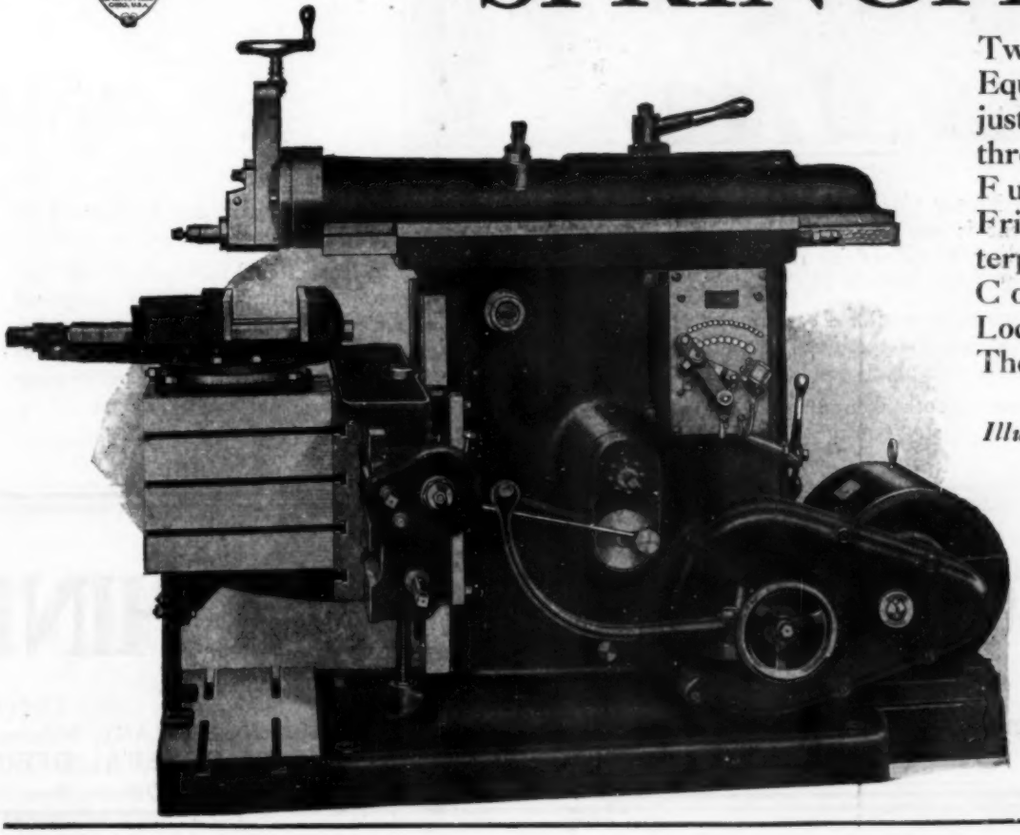
TRADE W.F. AND J.B. MARK

Made by

W. F. & JOHN BARNES CO.
1995 Ruby Street, Rockford, Ill., U. S. A.

The Springfield Machine Tool Co. Springfield, Ohio, U.S.A.

SPRINGFIELD



Twenty-inch Shaper Equipped With Adjustable Speed Motor through Gear Train. Furnished With Friction Clutch Interposed With Lever Conveniently Located. All Gears Thoroughly Guarded.

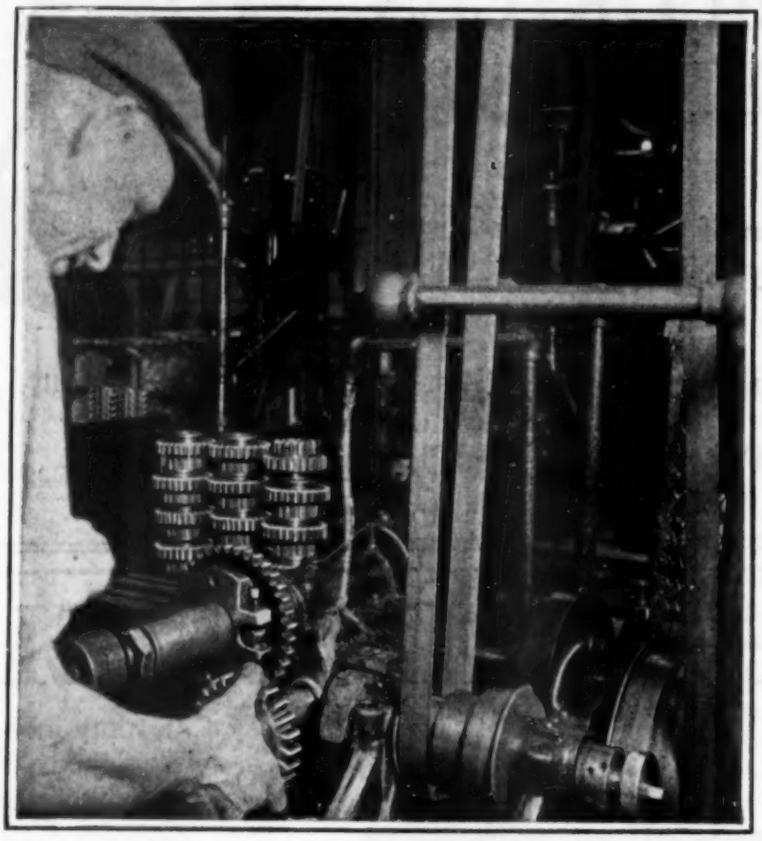
Ask for Illustrated Catalog "J"

The Springfield Machine Tool Co.
Springfield, Ohio, U.S.A.

AGENTS: Manning, Maxwell & Moore, Inc., New York, Boston, Philadelphia, Buffalo, Syracuse, New Haven, Pittsburgh, St. Louis, San Francisco, Seattle, Cincinnati; The E. L. Essley Machinery Co., Chicago, Ill.; The Riverside Machine Depot, Detroit, Mich.; The Cleveland Duplex Machinery Co., Cleveland, Ohio.

ROCHESTER

Gear Tooth Rounding Machine



A finished gear every 3 minutes

The Hudson Motor Car Company's gear generating department is equipped with Rochester Gear Tooth Rounding Machines for rounding the teeth on transmission gears used in Hudson cars.

The photograph shows one of a battery of Rochester Machines rounding the teeth of 18-tooth, 6-pitch steel gears at the rate of 20 per hour.

Rochester Gear Tooth Rounding Machines will round the teeth of any type gear from 1½ in. to 30 in. diameter and practically any pitch, and do not require skilled help to operate.

When you buy a Rochester Machine you are not experimenting—you are confirming the judgment of the world's largest gear manufacturers, machine tool builders, automobile manufacturers, etc., in whose plants these machines are performing efficiently.

May we send you a catalog?

BETTS MACHINE PLANT

of

CONSOLIDATED MACHINE

of

BETTS MACHINE PLANT, Rochester, N. Y. MODERN TOOL PLANT, Erie, Pa. HILLES & JONES PLANT, Wilmington,

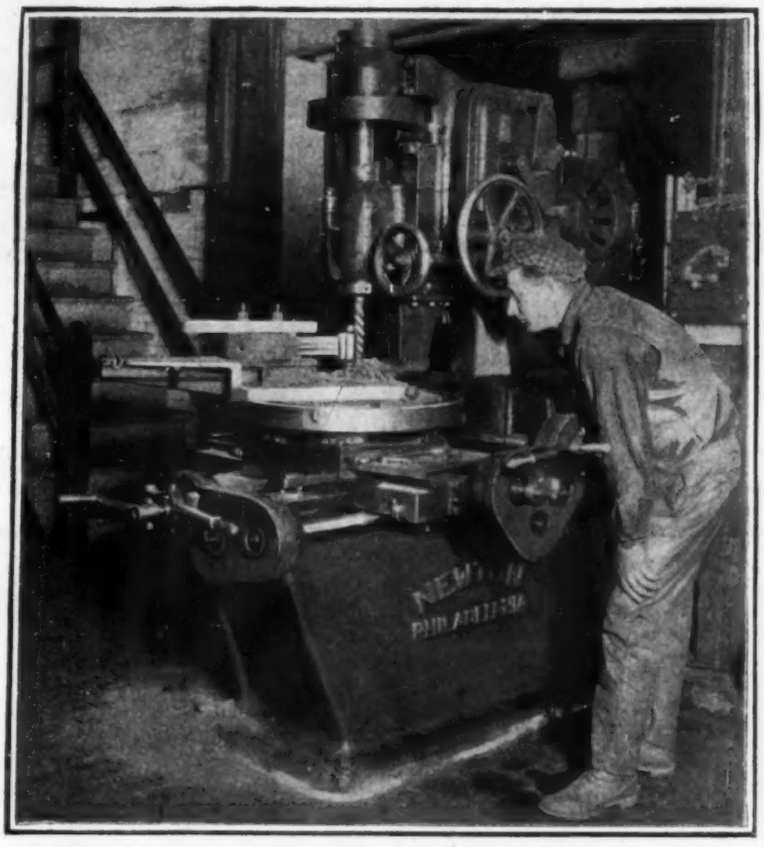
GENERAL OFFICE:

***District Sales Offices:* New York,**

NEWTON
(REGISTERED TRADE MARK)

Vertical Milling Machine

Increased production 250% on this milling job



This illustration shows the NEWTON Vertical Milling Machine in the plant of the Brunswick Refrigeration Company, New Brunswick, N. J., milling a three-quarter radius on an eccentric strap for a one-ton ammonia compressor.

The diameters milled on these eccentric straps vary from 2⅛ in. on the strap for a ¼-ton compressor to 3¾ in. on that for a 17½-ton compressor.

Formerly a slotting machine was used on this work, but the "NEWTON" gives a 250% greater production.

For lowering machining time on work of this sort the "NEWTON" is particularly effective. It is adaptable to a wide range of operations and without doubt can cut costs on some of your work that you are doing by other methods.

Get the complete facts before you. A line brings them to you.

NEWTON MACHINE TOOL PLANT

of

TOOL CORPORATION

America

Del. **NEWTON MACHINE TOOL PLANT, Philadelphia** **COLBURN MACHINE TOOL PLANT, Cleveland, Ohio**

17 East 42nd St., New York

Philadelphia, Pittsburgh, Chicago, St. Louis

Making Big Advances in Boring Mill Practice

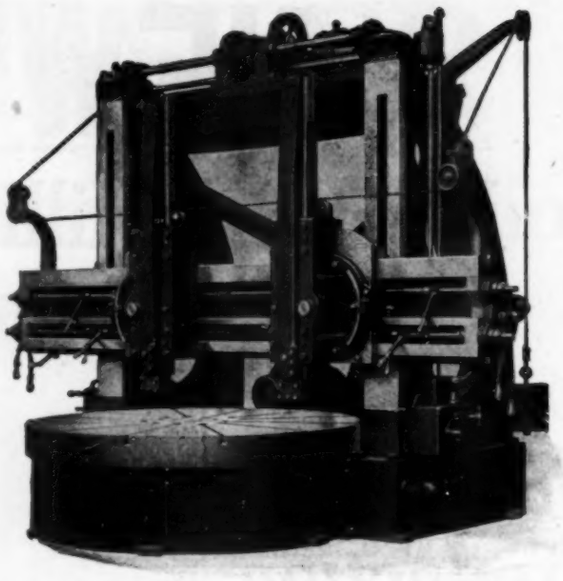
Boring mills are today being called upon to produce a class of work heretofore believed impossible with a machine of this class.

We are not backward in stating that **Cincinnti Boring Mills** have been a prime factor in this advance.

They possess the power and stamina to back the coarsest feeds at high speeds; control, centralized, minimizes operating error and thus practically prevents work spoilage; close and simple adjustments hold to the finest tolerance limits.

Our 42-in. and 48-in. Mills—Bevel Gear Type—have a capacity of 39 in. under tool-holder—bed heavily ribbed—housings box form construction—Rapid Power Traverse to heads—Forced Lubrication.

Show the other fellow your heels with a **Cincinnati.**



CINCINNATI
Boring Mill

The Cincinnati Planer Co., - Cincinnati, Ohio

Price Plays No Part In Performance

Because we can produce and market Standard Gauge Machine Rack at a more reasonable figure than other rack of similar grade does not infer that its quality is lower.

Our experience in producing the special analysis O.H. steel itself, and in machining and straightening, cannot be dupljcated elsewhere. There is *one* national headquarters for MACHINE RACK—regardless of pitch or size. Try us and see.

Our line includes turned and cold drawn steel shafting, finished common and special shapes. Compressed steel elevator guides, connecting rods and crank shafts. Screw stock, feed screws, lead screws and worm. Send for list.

Standard Gauge Machine Rack

GSS

Standard Gauge Steel Co., Beaver Falls, Pa.

DISTRICT OFFICES: 52 Vanderbilt Ave., New York; 1050 Oliver Bldg., Boston; 1240 Old Colony B.dg., Chicago, Ill.; 611 Harrison Bldg., Philadelphia, Pa.; 505 Capital Theatre Bldg., Detroit, Mich. REPRESENTATIVES: P. C. Abbott & Co., Richmond, Va.; Roloph Mill & Co., San Francisco, Cal.; A. Campbell White, New Orleans, La.

IT IS THE SPEED OF THE CUT THAT AMAZES THEM

HERE is an Aloxite Wheel specially developed for the purpose of rough grinding steel castings, manganese, malleables and for general steel work. It is a coarse grit, heavy duty wheel that is made to lower grinding costs by producing greater tonnage in the grinding room.

In one plant, for instance, on grinding steel castings, this wheel did 25% more work and lasted 42½ hours longer than the best competing wheel.

This wheel cuts faster and produces more because of its open porous structure and because of the superior abrasive ability of the hard, sharp, tough Aloxite Grain.

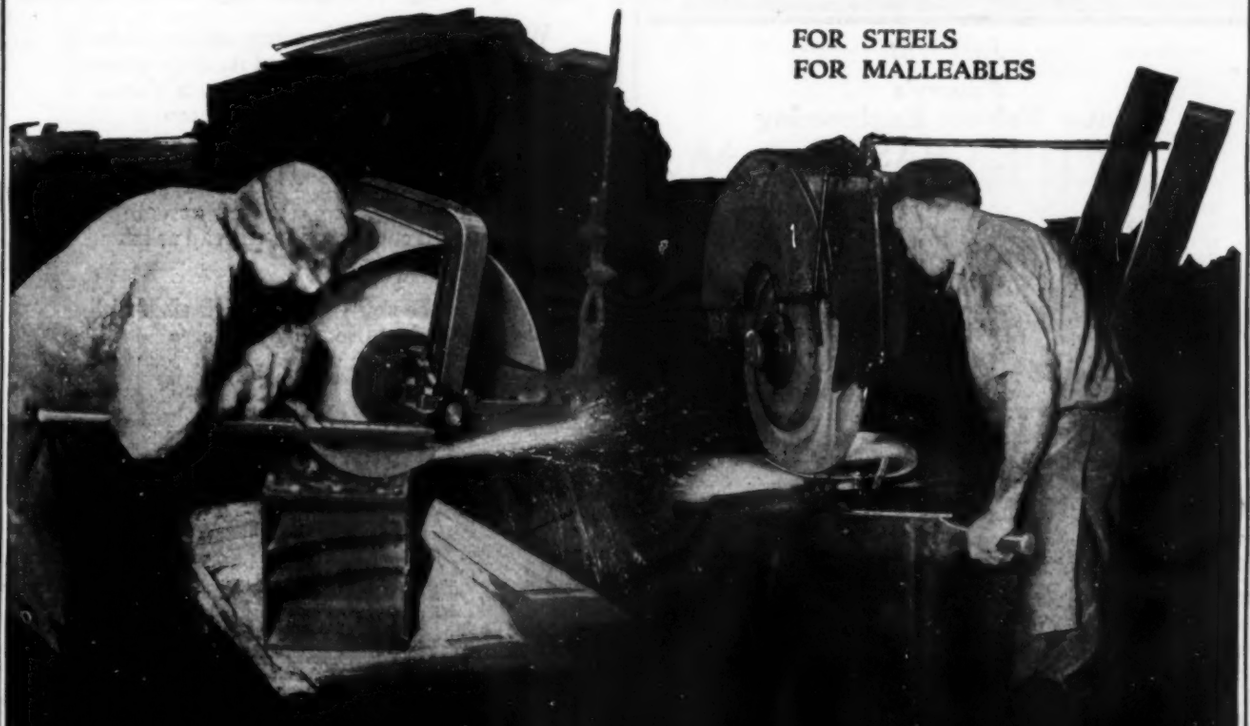
Every grain gets a real chance to cut because it has a definite clearance. The wheel doesn't fill and requires but little dressing.

It is a durable wheel that shows long enough life to be economical—yet it has the astonishing speed of cut.

Our Sales Service Department will gladly see to it that you get the right wheel in the right place.

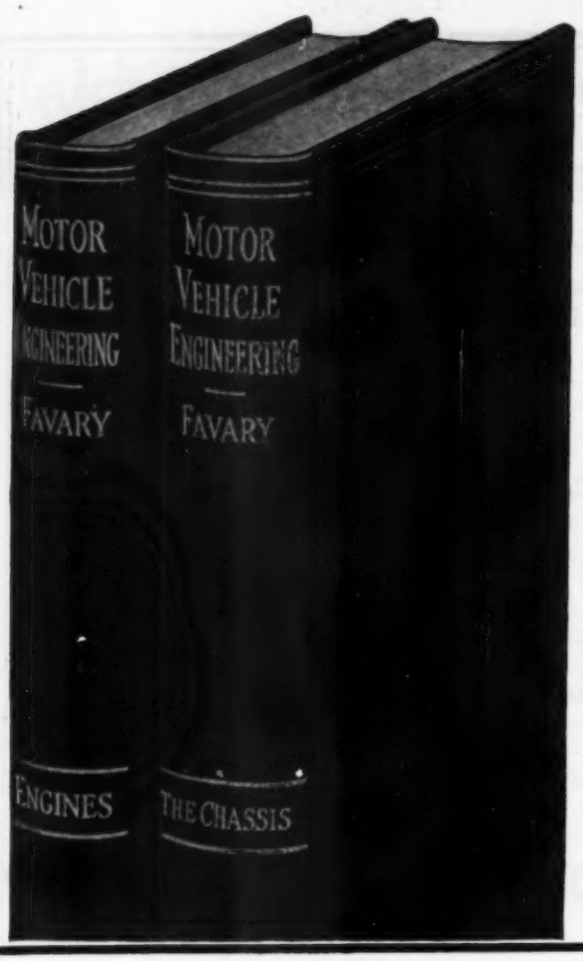
ALOXITE GRINDING WHEELS

FOR STEELS
FOR MALLEABLES



The Carborundum Company, Niagara Falls, N. Y. U.S.A.

New York, Boston, Philadelphia, Chicago, Cleveland, Cincinnati, Milwaukee, Pittsburgh, Detroit, Grand Rapids



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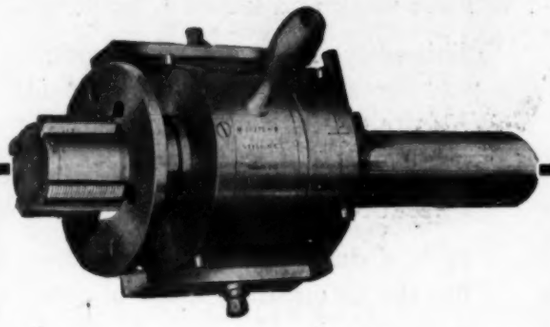
Whether Special or Standard

you get a better threaded job with

Geometrics

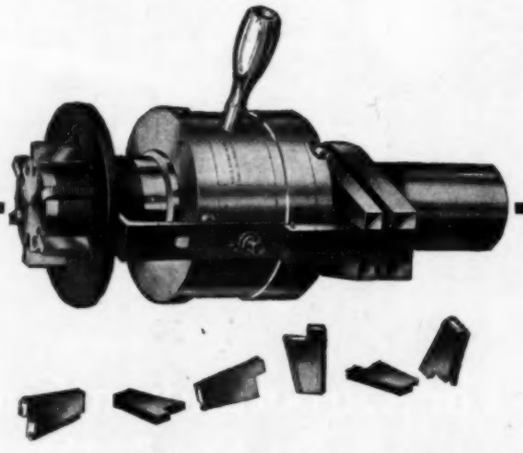


GEOMETRIC Collapsing Taps usually advance production a full 50% over that resulting from using solid taps. Backing out time is minimized and thus threads are not damaged nor crossed.

Whatever the need in screw cutting, there is a Geometric to take care of it. Adjustments to correct diameter each time a thread is tapped. The Chasers collapse automatically, leaving the thread clean cut and perfect.

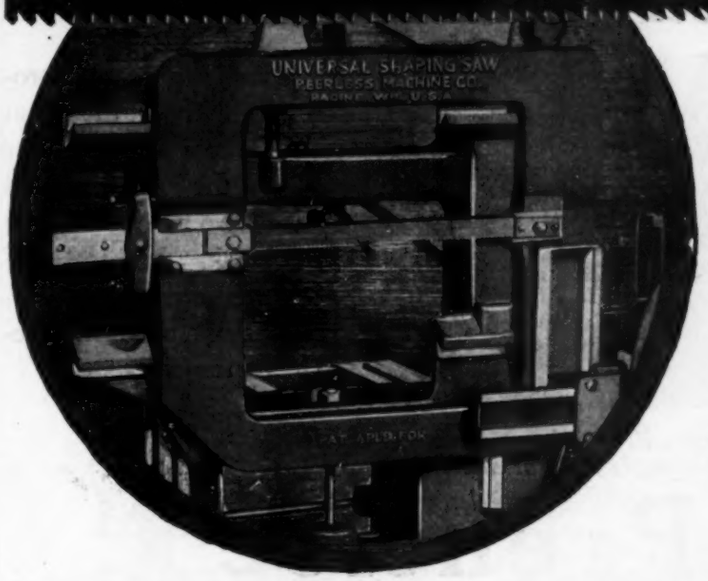
The Chasers are readily reground, and when finally used up, are renewed at comparatively small cost, leaving the tap as efficient as when new.

Let us make you familiar with the full line of Geometric Threading Tools.



The Geometric Tool Company

New Haven, Connecticut, U. S. A.



A Toolroom Conversation

Stockroom Man: "You will have to use 4 in. x 4 in. stock and shape off ½ in. on one side."

Tool Maker: "That's easy. I won't shape off that half inch; I'll *saw* it off. Then I'll use the strip I saw off for a plate or a strap part."

Stockroom Man: "Is that right? I can see where we won't need to carry so much stock, and there won't be so much scraps going out of the toolroom at only scrap prices. We will save both ways."

THINK IT OVER

Write today for information

PEERLESS MACHINE COMPANY
1360 Clark St.
Racine **Wisconsin**

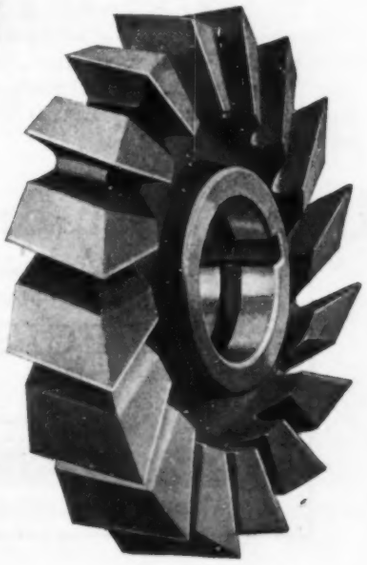
Peerless

Still Faster
UNIVERSAL
SHAPING SAW

BARBER-COLMAN

HEAVY DUTY CUTTERS
FOR
STRADDLE MILLING

Notice the spiral undercut teeth on the face and deeply cut side teeth. They combine to give maximum production, longer wearing life and smoother cutting.



Write for our pamphlet.

BARBER-COLMAN COMPANY

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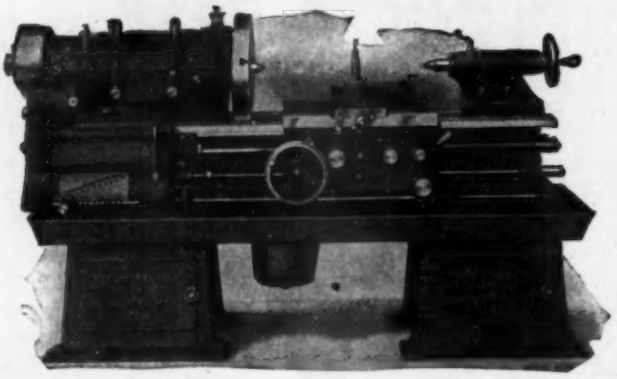
ACCURATE

DEPENDABLE

51

A New Standard in Geared Head Lathe Construction

This REED-PRENTICE GEARED HEAD LATHE embodies all the modern practical developments that have proven their merits in actual service.



It is a powerful production lathe that assures an increase in the quantity and accuracy of the work, besides exceedingly low operating and maintenance costs.

A thorough investigation will convince you of its merits. Do you want complete information?

Reed-Prentice Co.

BECKER MILLING MACHINES
LATHES—RADIAL DRILLS
PRODUCTION LATHES

WHITCOMB SECOND BELT DRIVE PLANERS—
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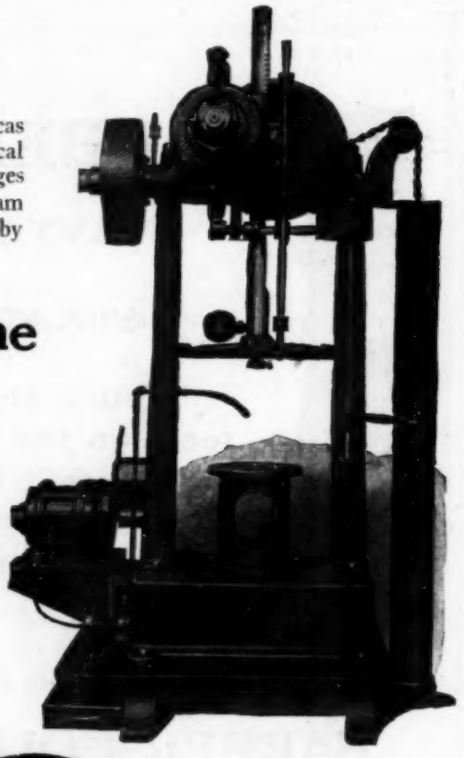
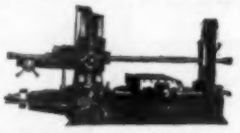
Proven in Service

The **Lucas Push Broaching Machine**—a modification of the Lucas Power Forcing Press—has started a highly successful career in vertical push broaching and production assembling. It possesses many advantages over the horizontal type of machine and will enter your economic program from a dozen angles. Let us tell you some of the ways you save by using the

Lucas Push-Broaching Machine



WE ALSO MAKE THE
"PRECISION"



BORING, DRILLING AND MILLING MACHINE

Lucas Machine Tool Co.

AGENTS:

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NOW AND ALWAYS OF

Cleveland
Ohio, U. S. A.

Gray Planers

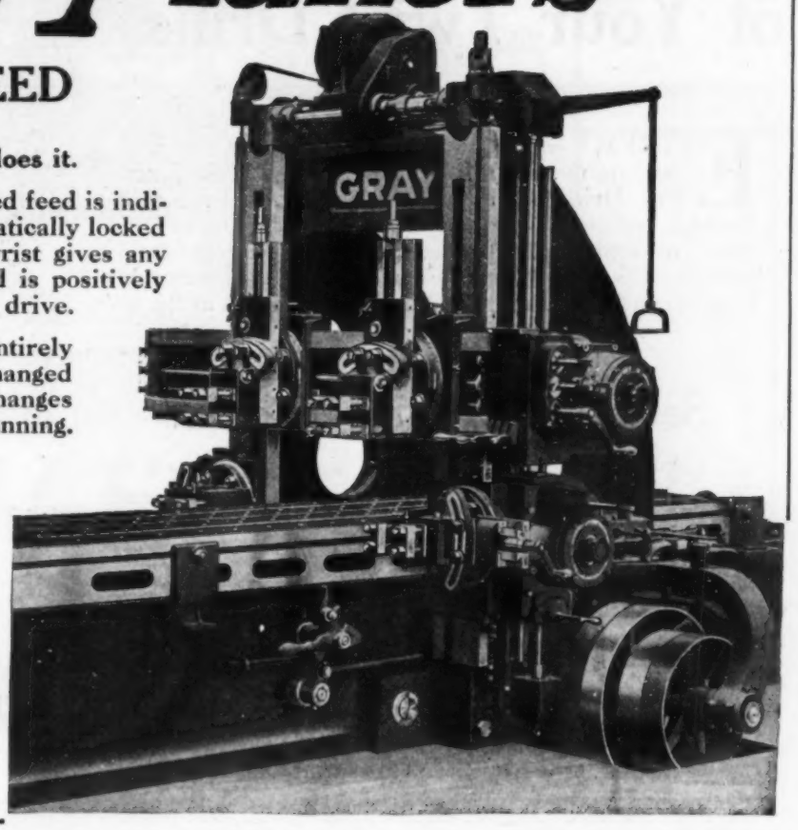
CAN'T-SLIP FEED

(Patented)

Instantly set—one motion does it.

Simply turn the knob until the desired feed is indicated on the dial. The dial is automatically locked where set. A partial turn of the wrist gives any feed from .01 in. to 1 in. The feed is positively driven—we do not rely on a friction drive.

Rail head and side head feeds are entirely independent so that one can be changed without affecting the other. Feed changes can be made while the planer is running.



This is one of

12 EXCLUSIVE FEATURES

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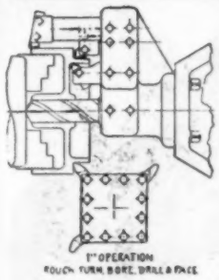
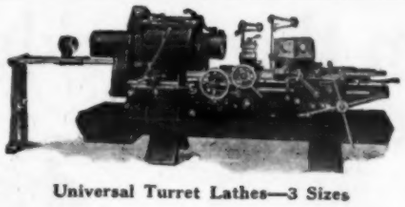
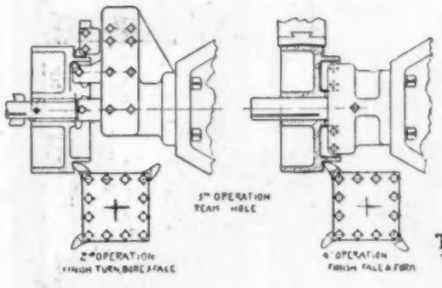
THE G. A. GRAY CO.
CINCINNATI, OHIO





Universal Turret Lathes—3 Sizes



The W. A. Barker Wrenchless Chuck

W. A. Barker Wrenchless Chucks quickly pay their cost by increased production. They reduce the chucking time.

Multiple Turning Tools on the I-B FOSTER Sets the Pace

The power rigidity and adaptability of every Foster makes the use of multiple tooling possible and the complete finishing of parts in the time required for the longest cut.

Note in the 1-B operation diagram for clutch pulleys—five cutters working simultaneously in the first and second operation, four in the fourth. The pulley is entirely finished in the time required to turn the outside diameter, except reaming the hole.

Send us your blue prints, let our engineers show you what multiple tooling will do for you.

THE FOSTER MACHINE CO. **Elkhart, Ind.**

Greatly Prolongs the Life of Your Twist Drills

EXTREME sensitiveness coupled with the closest accuracy are the two prime factors in the **A. M. Sensitive Drilling Machine** that minimize twist drill breakage and thus lower producing costs. It possesses the "feel" required for drilling holes as small as ten one-thousandths yet is sturdy enough to make high producing records. Every mechanic will appreciate the qualities found in the

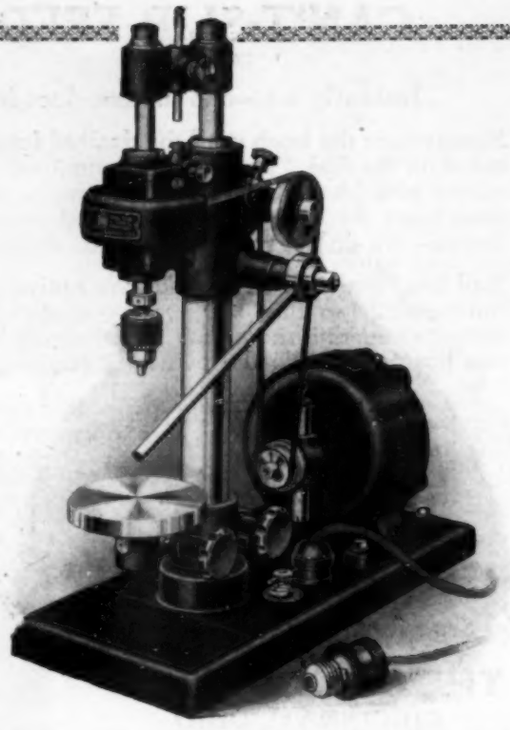
A. M. Sensitive Drilling Machine

We have been building Sensitive Drilling Machines for over 30 years and our books contain the names of the most particular users.

The **"A. M."** is a complete unit in itself and will fit admirably in your experimental department, tool room or in general manufacturing.

A copy of the Circular will convince you of its quality

ADOLPH MUEHLMATT
5th and Elm Sts., Cincinnati, O.



Free your shop from the shackles of old-style planers and planing

In many shops improvements have been made in all departments but the planing department. The efficiency in such shops is greatly hampered by their old-style planers.

The planing department in most of these plants has been neglected, no doubt, due to a failure to appreciate the many necessary developments that have been introduced in the planer field by the

Liberty Quality Planers

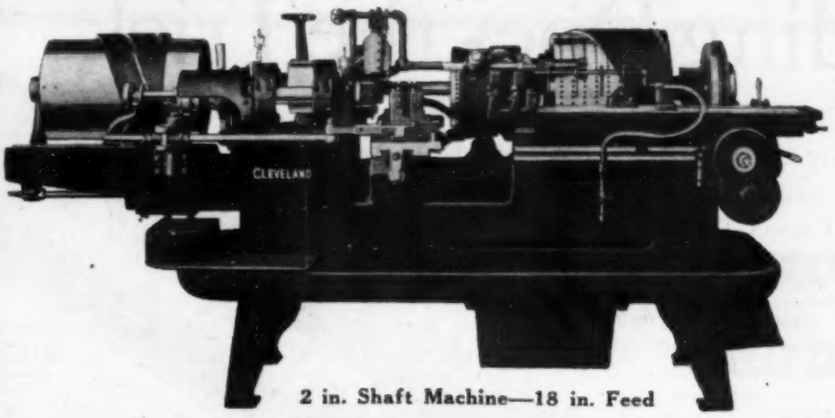
Here are a few of these profit-making developments:

PATENTED 4-speed Belt Drive; PATENTED Feed Mechanism for both rail and side heads; forced feed; Clapper Box Clamp (PATENTED); Tool Box in bed, Micrometer Collars and Box Type Table.

Look into this question of bringing the efficiency of your planer department on a par with that of the rest of your plant with **Liberty Planers.** Write for full details today.

The Liberty Machine Tool Company
Hamilton, Ohio

Quality Standard Type Planer. Sizes 22 in. to 72 in. Open-side Planers 24 in. to 84 in.



2 in. Shaft Machine—18 in. Feed

shafts of various shapes produced rapidly on the

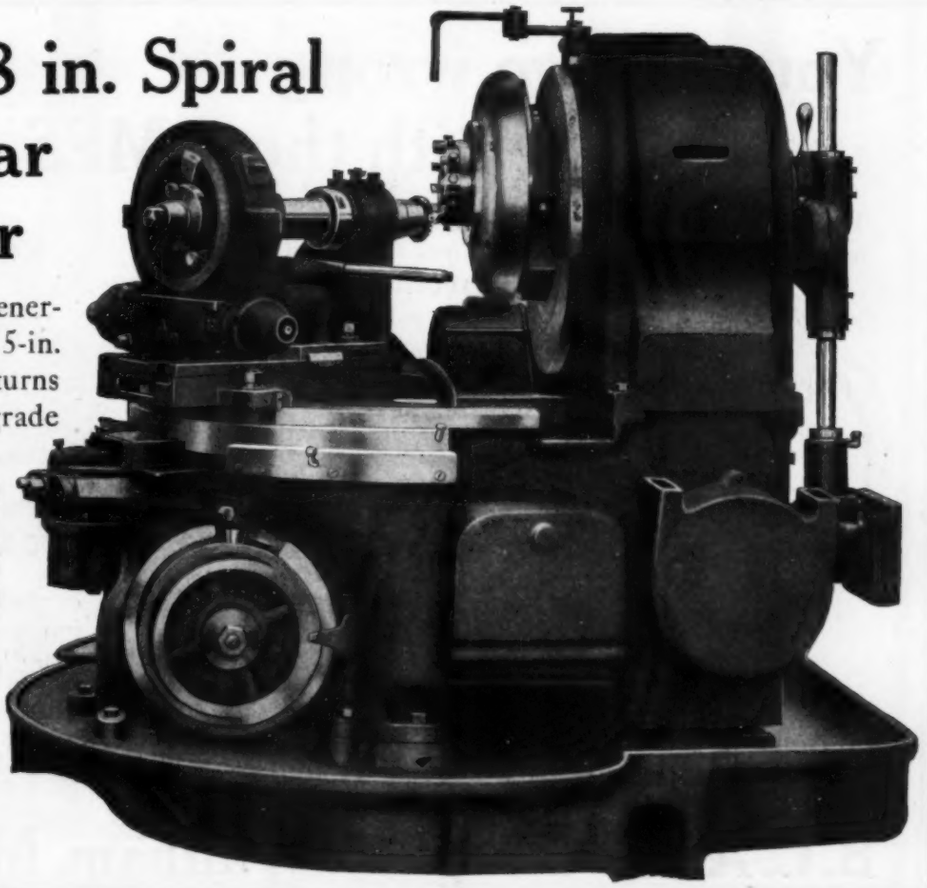
"CLEVELAND"

up to 18-in. long. Tapers, shoulders and necks formed accurately. Allow us to furnish you details of producing your products on the "Cleveland."

The Cleveland Automatic Machine Co., Cleveland, Ohio

Gleason 8 in. Spiral Bevel Gear Generator

Operates on the same generating principle as our 15-in. standard machine and turns out an equally high grade product, but has several special features which give it added speed in production on gears from 3 in. to 10 in. in diameter.



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Rochester, N. Y.

Grinding Does the Trick

There are a number of advantages that can be obtained only through grinding a tap to form.

1st—Grinding insures correct lead and angle.

2nd—A Bath Ground Tap is guaranteed to cut to exact size because *all* inaccuracies are removed in grinding by the Bath System.

3rd—Positive concentricity results from grinding shank, flute faces and teeth on the same centers.

Bath
HIGH SPEED STEEL
"Sharpening Face Flute"
Ground Taps

are different from any thread cutting tool you have ever used. They are absolutely reliable because of their correctness in size, lead and angle. Let us send you a circular that explains in detail.

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John Bath & Co.

Worcester, Mass.

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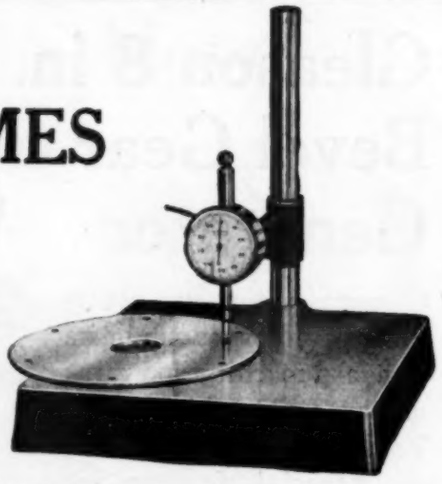
"Ground from the Solid"

You can't go wrong with the AMES

There's no guesswork about limits when you check your work with the **Ames Dial Gauge.** The dial shows just how much "over" or "under" the piece has been machined and the mechanic can thus go ahead and work to known figures.



AMES Dial Gauges

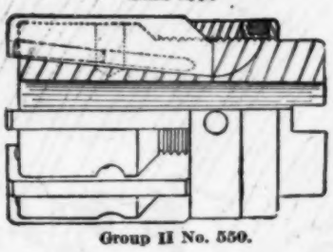
prove invaluable as checks on duplicate part production. There is practically no gauging job they cannot accomplish and the time they save assures greater profits.

The **Ames** comes in a number of different styles, thus enabling you to meet your gauging needs with exactness.

Let us tell you all about this and the other AMES products.

B. C. Ames Company, Waltham, Mass., U.S.A.

Sectional View.
Shell Type



Group II No. 550.

One of the three distinct types designed to meet all requirements

Davis Expansion Reamers

(Patented 1912)

Simplicity—
the keynote of efficiency

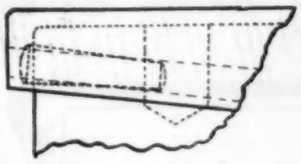
In the simple design, is found the principal factor of Davis Expansion Reamer efficiency. Here, numerous features and advantages are embodied that simplify the operator's responsibility to such extent, as to insure definite results with minimum effort.

The unique engineering principle involved in the method of holding blades (with hardened and ground taper pins), is the most singular feature of Davis Expansion Reamers. Taper pins, fitted as shown in illustration, have 100 times the holding power of separate blade screws.

Expansion of blades is uniformly forward on taper—thus eliminating circular grinding when adjusting; while the ends of blades project and cut in advance of reamer body for perfect bottoming.

Many other distinctive features, including liberal range of expansion with blades interchangeable in various size reamers, will interest those who are anxious to realize the full possibilities in their reaming production.

Reamer Catalog No. 540 tells the full story in an interesting manner. Send for it today.



The taper pin is fitted almost entirely in the reamer body, at special angles, so that entire length of taper pin has perfect bearing in blade groove. Line contact only, in blade groove, results in a constant downward and lateral thrust that does not interfere with free movement of blades in adjustment.

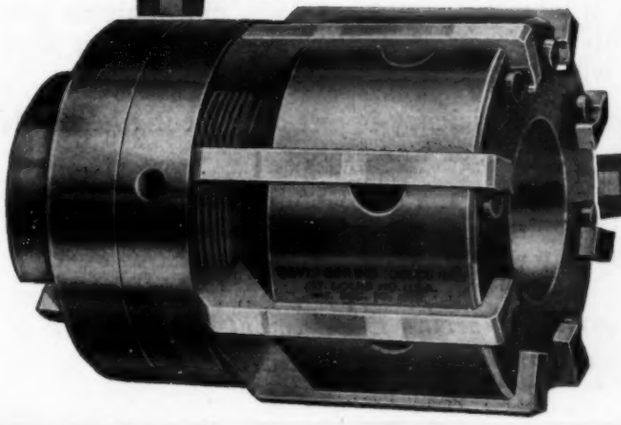
Davis Boring Tool Company

Incorporated

3706-30 Forest Park Boulevard

St. Louis, Mo., U. S. A.

We Supply the World with Expansion Boring Tools and Expansion Reamers.

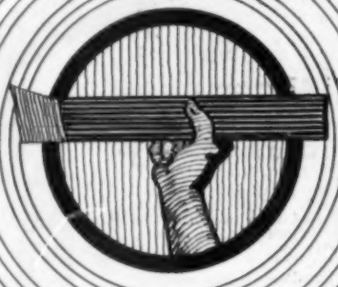


Note how contact of taper pin in blade groove exerts a downward and lateral thrust.

Shell Type.
Group II No. 550

LARGEST EXCLUSIVE MANUFACTURERS OF EXPANSION BORING TOOLS AND EXPANSION REAMERS

"Red Cut Cobalt" High Speed STEEL



75% More Pieces Per Grind

"RED CUT COBALT" Treated Bits were recently introduced at the plant of the American Bearing and Die Casting Company by one of their lathe operators. In a short time he was turning out three bearings to every one by other operators with the result that Red Cut Cobalt Tool Bits were immediately adopted for all heavy turning, forming and boring work. Today this company is obtaining at least 75% more pieces per grind with a 25% increase in production over that received when numerous other brands were used.

This wonderful efficiency is just as evident when tools are made of Red Cut Cobalt Bar Stock.

You, too, can effect the same savings in your plant by standardizing on "Red Cut Cobalt" for your severe cutting operations.

Ask our Engineering Department for complete information and recommendations

VANADIUM-ALLOYS STEEL CO.

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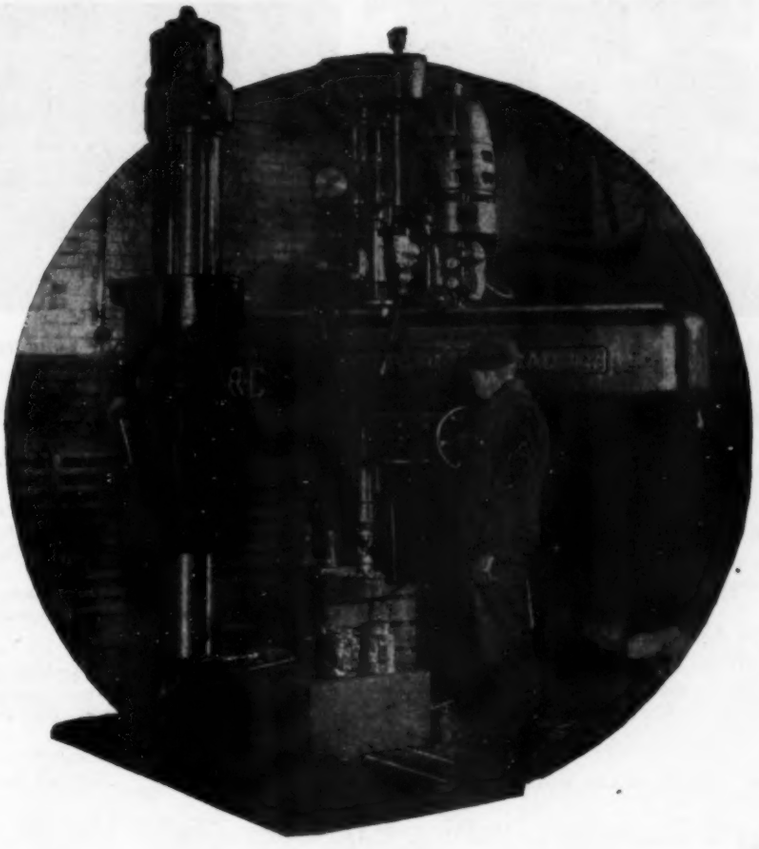

Inspires Confidence

A new Ryerson-Conradson radial was being tested in a railroad shop.

After successfully drilling a 3 5/16-in. hole at an astonishing rate, the foreman was asked to duplicate the cut on another competing machine for equal size.

"Not much!" was the reply. It would be deliberate destruction.

Such experiences are common in shops where the sturdy construction of the Ryerson-Conradson radial gives confidence to the operator to secure the utmost from his machine.

Concerning construction details ask for Bulletin 4001.

JOSEPH T. RYERSON & SON

Established 1842 Incorporated 1888

Plants: Chicago St. Louis Detroit Buffalo New York

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RYERSON MACHINERY

The Gage Method of Screw Thread Inspection

The Hartness Comparator Method

Cut the cost of your screw thread inspection and make it infallible during the new year

The HARTNESS Screw Thread Comparator offers you the opportunity to do just that.

Look at the old method on the left. Note the size of the force you have to maintain for screw thread inspection with the gage method.

Then see how one man with the Hartness Screw Thread Comparator handles the same job.

But that isn't all. The gage method REJECTS some of the BEST screws and ACCEPTS some of the WORST. The Hartness method rejects only those that are actually bad and accepts only those that are actually good.

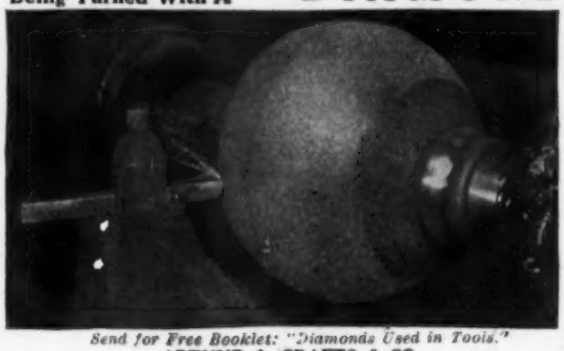
You can readily appreciate the truth of this when you stop to consider that with the ring gage method the threads fit or they don't fit. Your inspector cannot tell just what the trouble is. With the Comparator, however, the character of every feature of the thread, such as size, lead, surface, etc., is made clearly visible to the eye. When you can see just what your thread troubles are you can soon eliminate them and cut down your rejections to practically nil.

From whatever point you look at it the Hartness Comparator Method is considerably less costly and productive of better results than any other method of inspecting screw threads.

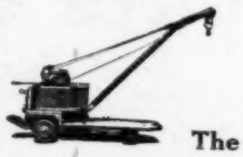
It is not a hard task to prove it to you conclusively. May we do so?

Jones & Lamson Machine Co., Springfield, Vt., U. S. A.

This Bowling Ball Is Being Turned With A DIAMOND



Send for Free Booklet: "Diamonds Used in Tools."
ARTHUR A. CRAFTS & CO.
125 Summer St., Boston, Mass.



Electric Industrial Crane Truck

Ready to Save the Cost of Wasteful Hand Trucking

Request Catalog 811.

The Elwell-Parker Electric Co.
Cleveland, Ohio

DIAMOND TOOLS

hold their cutting edges for months. Can easily be sharpened and will last for years. Leave a smooth, true and finished surface. These special shaped carbon, black diamond, pointed tools are best for turning paper, cotton, corn husk, rag, fibre, hard rubber, etc. They turn out a large number of pieces of exact uniform size.

THOS. L. DICKINSON
38 Gold Street New York
Successor to John Dickinson. Estab. 1796

ROCKWOOD
PRESSED STEEL
MACHINE HANDLES
Cold Drawn from strip Steel

Rockwood Handles are Hollow and Seamless, Combining Strength with Lightness, Balance and Uniformity of Shape. Tell us your requirements and we will send you sample and prices.

ROCKWOOD SPRINKLER CO. of MASSACHUSETTS
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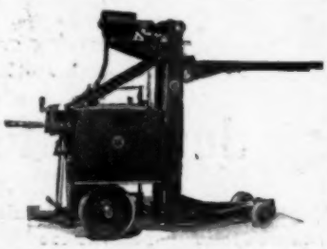


Pick-up, Carry and Elevate 4000 lb. loads

A new series of installation folders showing users of the LAKEWOOD TIER-LIFT TRUCK in different industries may offer suggestions for similar economies in your plant.

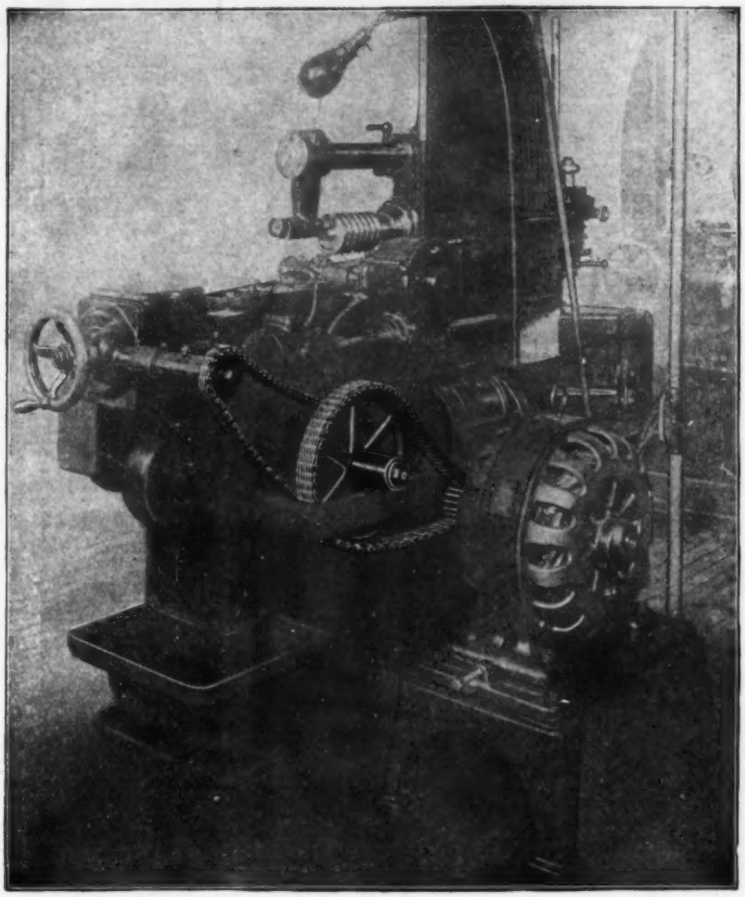
Ask for Series A

Lakewood Engineering Co., Cleveland, O.

"WHITNEY"

Long Service

SILENT TYPE CHAIN



"Whitney" Chains Driving Gear Cutter and Feed. Chain Guards Removed.

It needs but little thought to convince you that wherever they can be used chain drives are far superior to belts. Remember, there is no slip to chains and whatever movement there is in the driving shaft is delivered without loss to the driven shaft.

This means increased production and greater uniformity in your output, as well as less cost of upkeep and an equipment which will last for years. Our Engineering Department is always at your service and it will cost you nothing to make use of our experience and suggestions.

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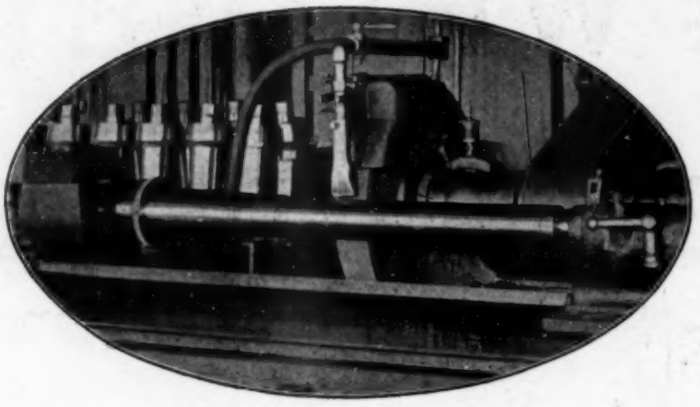


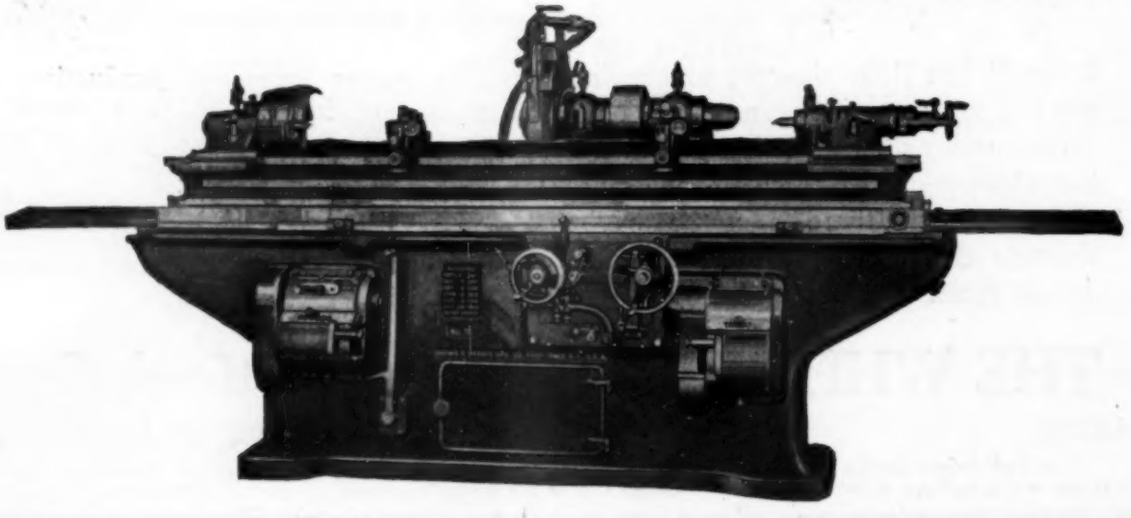
Two essentials for good work —High-grade Machines and

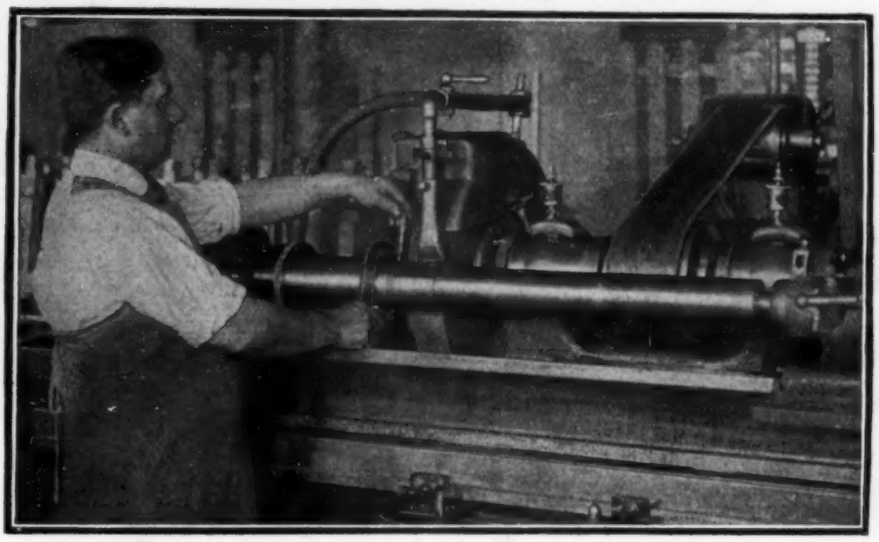
The quality of work a machine produces depends on the quality of the machine itself—particularly true of a grinding machine. To grind work to close limits with a smooth, even finish requires a machine correct in every detail of design and manufacture.

The combined skill of experienced engineers and expert workmen gives Brown & Sharpe Grinding Machines the qualities essential for producing good work. Manufacturers seeking a satisfactory solution of their grinding problems should consider the advantages of

BROWN & SHARPE
PLAIN GRINDING MACHINES

Send for Catalog No. 137





Reliable Machinists' Tools

Without reliable tools the mechanic working to close limits is at a serious disadvantage. The quality of his work and the speed of his production are largely influenced by the confidence he has in the tools he uses. Brown & Sharpe Tools are dependable and give men the confidence essential for good work. Every mechanic will be interested in

the new line of REX MICROMETERS

Rex—a complete line of Brown & Sharpe Micrometers in 24 sizes covering a range from 0 to 24 in. Sturdy frame of I-section combines lightness with strength. The rectangular shape of the frame gives greater measuring capacity than a frame of the circular type. Every Rex Micrometer is regularly furnished with a Clamp Ring which locks the spindle and preserves the setting.

Write for Rex Circular

BROWN & SHARPE MFG. CO.
PROVIDENCE, R. I., U. S. A.

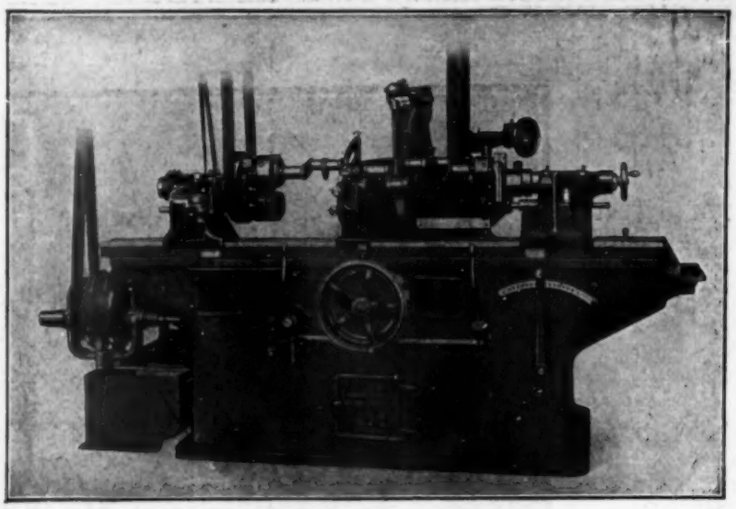
Rex Micrometers are Brown & Sharpe Tools

Every Season is Repair Season

There are no "off seasons" for the automobile repair man. Spring and Fall usually find the business at peak, but the wheels keep turning at all other times—especially in shops equipped with the

LANDIS

4-A Special Grinding Machine



The **Landis** is practically a number of specialized grinding machines combined in a single unit.

It grinds crankshafts, pistons, wrist pins, piston rings, valves, valve stems, transmission gears, etc.

You cannot afford to ignore this opportunity to establish yourself in a growing business.

We shall be pleased to show you what this machine has been doing in the motor repair field.

LANDIS TOOL COMPANY, Waynesboro, Pa.

New York Office: 51 Chambers St.

DOMESTIC AGENTS—Hallidie Machinery Co., Seattle; Smith, Booth, Usher Co., San Francisco and Los Angeles; Southern Machinery Sales Co., Houston; Fulton Supply Co., Atlanta; F. C. Richmond Machinery Co., Salt Lake City.
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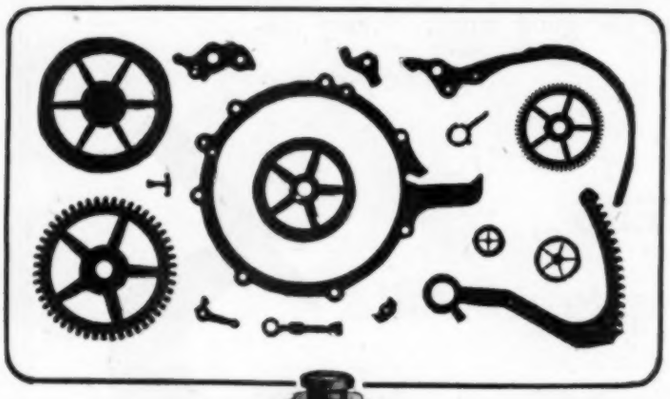


No Filing nor Hand Trimming

When a stamped or punched part is produced on the **Waltham Sub Press and Dies** it is ready for assembling. It is not warped nor twisted, nor are the edges burred. By eliminating all hand finishing greater producing profits are assured. In the

Let us know the type of stampings you use and we will suggest methods for their improvement at lower producing cost. Also ask us about the other Waltham products.

Waltham

Sub Press and Dies

correct and continued alignment is the prime factor. Not only does this give better results, but it greatly prolongs the life of the dies.

The **Waltham** line of **Sub Presses and Dies** is most complete and our Compound Dies are mechanically correct in every detail.

Waltham Machine Works, High Street, Waltham, Mass.

this → is all right

BUT

What to Do when Your Last Hacksaw Breaks

WHILE cutting off the end of a projecting bolt, a service station mechanic buckled the blade of his hacksaw and snapped it off about 2 in. from one end. While he went for a hammer and chisel to finish the job, the foreman picked up the broken blade, held it in the flame of a blowtorch and, while it was still warm, drilled a hole through it with a hand drill. He then replaced it in the adjustable saw frame and had the saw ready for finishing the job by the time the mechanic returned. This is a stunt well worth remembering because it is usually the last hacksaw that breaks the quickest.—S. R. D.

Reprinted by permission from the October issue of Popular Science Monthly.

here's a better stunt

Use Starrett Hack Saws and you won't be troubled with blade breakage—either on the last or the first hack saw. Get the most work out of these unexcelled hack saws through the Starrett Hack Saw Chart (sent free on request). It shows at a glance just which blade to use for every metal and shape. Use of this chart means longer life for every blade and the fastest possible cutting time for every job. Write for "Hack Saws and their Use," the first and most authoritative book on this subject. Free on request.

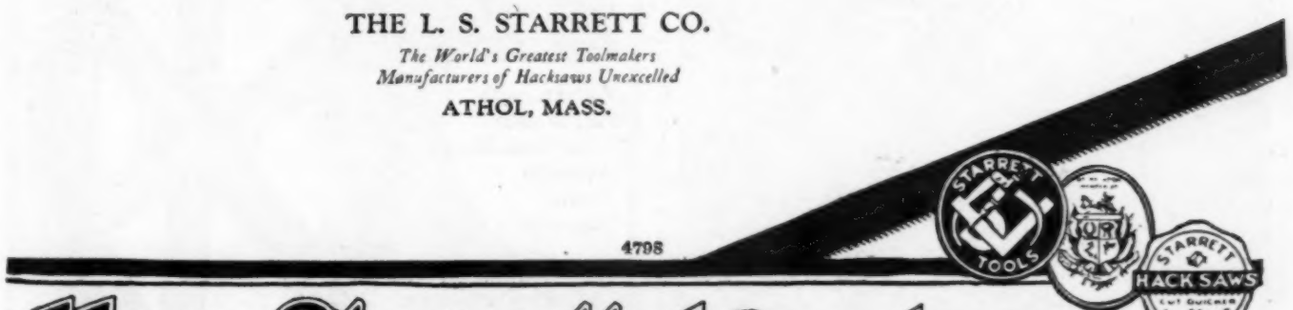
Also write for Catalog No. 22 C and the Supplement describing the new Starrett Tools

THE L. S. STARRETT CO.

The World's Greatest Toolmakers
Manufacturers of Hacksaws Unexcelled

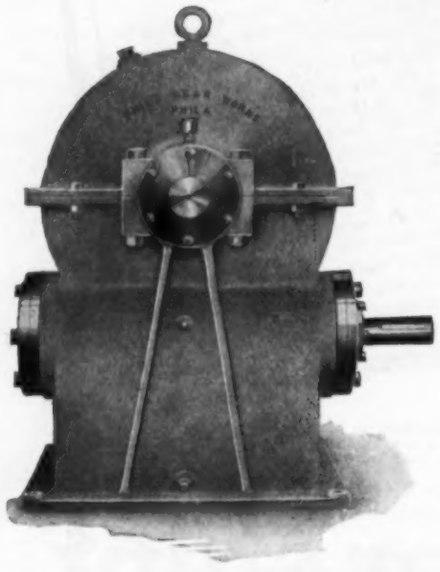
ATHOL, MASS.

4798



Use Starrett Hacksaws

Put the Ban on Friction



It is no longer necessary to employ heavy-running nests of gears to obtain the required operating speeds. **Philadelphia Worm Gear Drives** are designed on mechanically correct lines and reduce speeds with minimum power waste.

Phillie Gear's Engineers co-operate in the design of efficient gear drives and have successfully solved difficult transmission problems in hundreds of instances.

Get in touch with them before deciding on that drive you are intending to install.

Ask for your copy of the **Phillie Gear Book** and note the completeness of the line.

"Hurry Orders and Breakdown Jobs"
—Immediate Attention

Spur — Bevel — Mitre — Spiral — Worm — Helical

Philadelphia GEAR Works, Phila. Pa.

Sprockets — Racks — Rawhide — Micarta — Gears

BOSTON Cut Gears

Years of close application to the requirements of particular Gear users have raised Boston Gears to an enviable position. From expert metallurgists to hair line inspectors they pass through the hand of experts who know nothing but **good** gears.

Get our Catalog and note the Service we can render.

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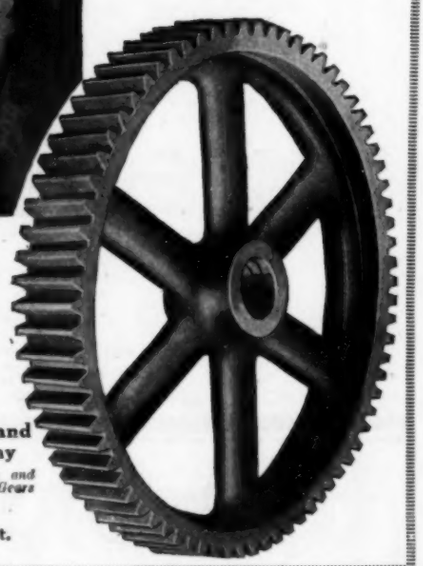
FOOTE DEPENDABLE GEARS



Full Strength
Full Weight
Close Grain Metal
Accurate
Tested
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Foote Bros. Gear and Machine Company
Manufacturers of Rawhide and Bakelite Pinions and Cut Gears of All Kinds
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Get in the Meachem Gear Circle

It consists of the wise manufacturers and shop owners who have found the way to obtain uniformly good gears at reasonable cost and *when wanted.*

We have 33 years' experience to help you determine the details that will make your gear drives successful, the special equipment required for accurate and economical production, and the organization to assure prompt attention to every order.

We accept full responsibility for quality and delivery, and as for price—send us blueprints of your work for estimate and compare our figures with yours.

Your next breakdown job will be a good opportunity to test MEACHEM Gear Service.

THE MEACHEM GEAR CORPORATION

Sole manufacturers of *new process* RAWHIDE GEARS and PINIONS—Still made under the direction of the inventors and the men responsible for every stage in their development.

Canal Street and West Shore Railroad
Syracuse, N. Y.

59

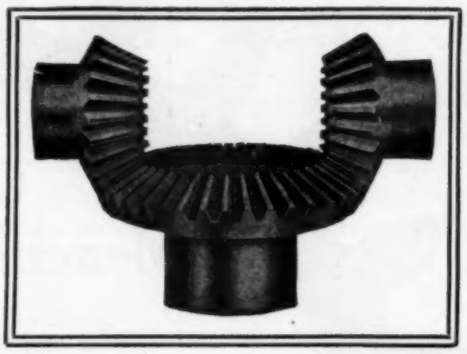
Have you any annoyingly noisy high-speed metal-to-metal gear drives? *New process* RAWHIDE PINIONS will silence them in a jiffy and permanently.

If You Want Good Gears, We Can Interest You

Because we have the experience and facilities to produce them in the shortest possible time and at very favorable prices.

Our modern daylight plant is acknowledged to be one of the finest gear production units in the world. Plenty of light and the latest machinery, together with a staff of real "gear men," ensure a very definite and essential element of quality in our gears. Our policy demands that this shall be maintained—always.

We mention these facts about our business, because they guarantee the soundness of our product and because they make us confident that we can do the same for you as we have done for others—give you efficient, practical gear service.



Cincinnati Gears

Cincinnati Gear Company, Cincinnati, Ohio, U. S. A.

MP

Meisel Gears—Meisel Service

The Most Practical Transmission Combination

Write Us Your Requirements

Meisel Press Mfg. Co.
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Our 44 years' experience in making gears is your guarantee of satisfactory service.

Large supply of stock gears always on hand for immediate shipment. Gears made to order —Any size, any material.

Estimates and gear advice cheerfully furnished.

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HERRINGBONE CUT GEARS

MILL DRIVES SPEED REDUCERS

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FAWCUS MACHINE CO. PITTSBURGH. PA.

"TRY SIMONDS GEARS"

They are accurately cut.
All kinds and all materials.

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WILL DO THE WORK
When Common Worm Gearing Fails
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The Earle Gear & Machine Co.
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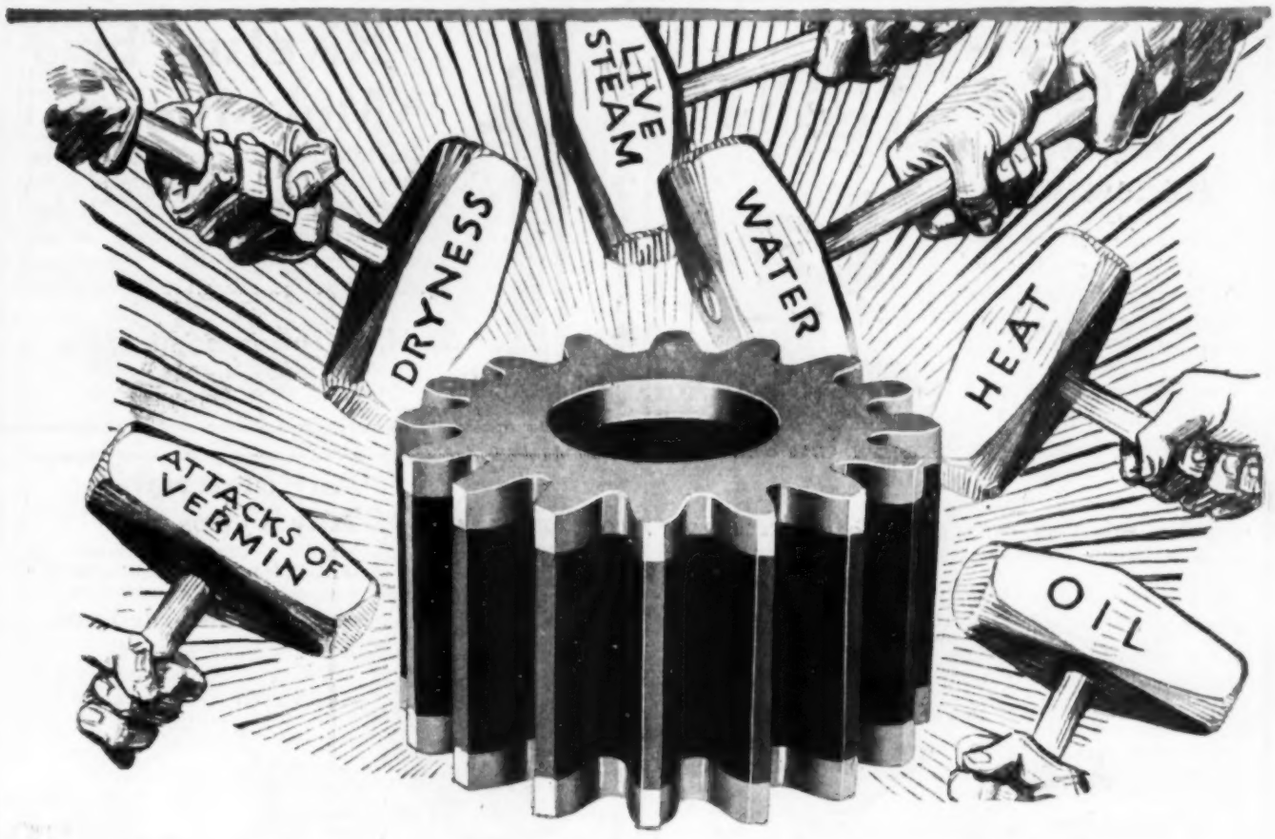

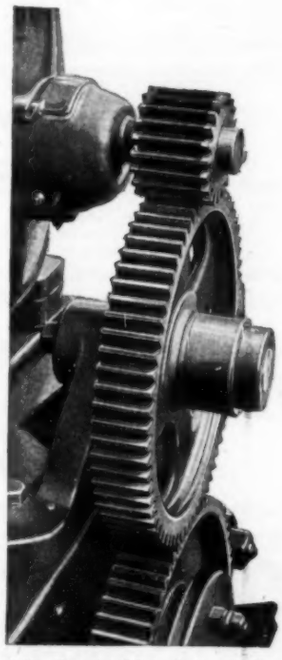

Only the working face of the Fabroil motor pinion at the top touches the companion gear.

The Fabroil Gear Repels These Hammer Blows

DEEP in the wet, rat-infested workings of a mine, or in a dry, clean power plant, in hot oil baths, or in icy atmosphere—no matter what destructive elements there may be, these tough, resilient gears are in no way affected.

The silence and smoothness of operation resulting from the installation of these gears is a revelation. And they outwear brass, iron, or any other non-metallic gear.

More than a million Fabroil Gears are in service throughout the United States, varying in size from one inch in diameter to 36 inches. In no case have they failed to prove all claims.

Try them and see for yourself.

Ask the G-E Sales Office nearest you for complete information

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Awkward Corners Made Accessible

GRANT

Hitherto the average output of riveting machines has been greatly decreased by the necessity of hand riveting inaccessible parts.

The Grant Rotary Vibrating Riveter has a specially designed head which allows it to reach those awkward corners, which would otherwise have to be done by hand.

Drives sixty good rivets a minute. No damaged heads or twisted shanks.

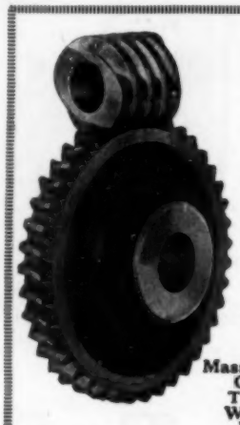
Write for our booklet "Perfect Riveting"

Grant Mfg. & Mach. Co.
Bridgeport, Conn.

Riveting by Multi-Blows

Our machine puts polished heads on rivets by striking a multitude of light blows—80 to 1000 per second. It does not distort or upset the work at any point except the heads. Tremendous speed and perfect finish are the features. *Circular?*

H. P. Townsend Mfg. Co.
Hartford, Conn.



Any Material—Any Type

Modern equipment manned by skilled mechanics permit us to meet your most exacting requirements in

Small and Medium Size Gears

A single trial order will prove that we put the quality and the "know how" in every MASSACHUSETTS GEAR.

Massachusetts Gear & Tool Co. Woburn, Mass.

MASSACHUSETTS GEARS

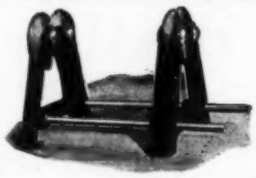
SHUSTER Automatic

Wire Straightening and Cutting Machines

require practically no attention after the coil of wire is inserted, so the operator has most of his time free for other work.
They make the wire perfectly straight.
They cut absolutely accurate lengths. At very small cost.

Don't you want to know more about them?

THE F. B. SHUSTER CO., New Haven, Conn.
Formerly John Adt & Son *Established 1866*



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BALANCING WAY

Made in various sizes for balancing Pulleys, Gin Brushes, Turbine Rotors, Crankshafts, Polishing Wheels, Flywheels, etc.

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Ready to accept Orders for immediate attention

Diefendorf Gear Corporation

Syracuse **New York**

GEARS for MOTOR MACHINE MILL or POWER PLANT

ENGINEERS FOUNDERS MACHINISTS MILLWRIGHTS
ESTABLISHED 1854
THE A. & F. BROWN CO.
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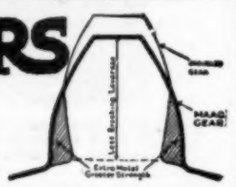
Planed Bevel Gears up to 48" diam.
Cut Spur Gears up to 96" diam.
Machine Moulded Gears up to 192" diam.

Steel, Semi Steel, Cast Iron, Bronze, Bakelite, Condensite, Fibre, etc.

MAAG GEARS

Strongest at the Base Where Others are Weakest
Catalogue No. 265



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INCORPORATED 1921

5 P or finer spur or worm gears 36 in. or smaller
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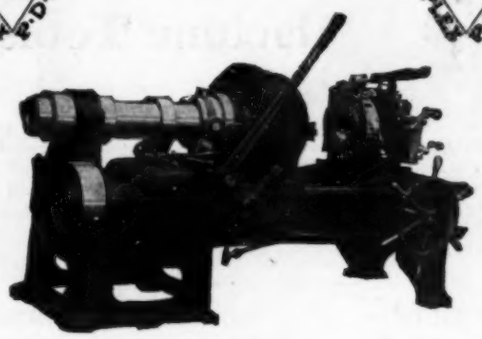

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Once on the job, they speed-up drilling, reaming, wood-boring, screw-setting, nut-and-bolt tightening—wherever there's a current outlet.

Your requirements are ideally met with a variety of sizes, built in A. C., D. C., and Universal Current types. Ask for bulletins.

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The Gorton Engraving Machine

A favorite in radio plants, for engraving and graduating bakelite dials, marking panels, etc.

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Our line embraces an almost endless number of combinations designed to meet the varied requirements of hydraulic systems.

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Special Engraving Machines for Engraving Radio Panels and Dials

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All Sizes All Types For All Pressures

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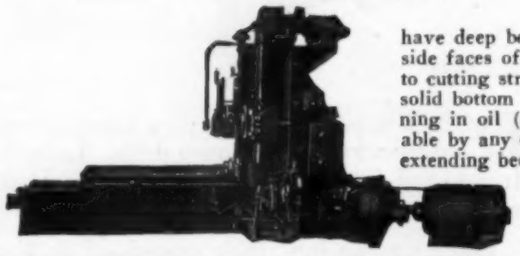

Sellers Planers

have deep box girder crossrail extending back between uprights and bolted to inside faces of uprights as well as to outside flanges, thus offering unusual resistance to cutting strain, particularly when crossrail is at top of uprights. Box table with solid bottom plate, driven by our well-known spiral pinion on diagonal shaft running in oil (the only gearing inside bed), giving smoothness of motion unobtainable by any other method and permitting bracing of bed between uprights without extending bed below floor level. Ways oiled by power pump.

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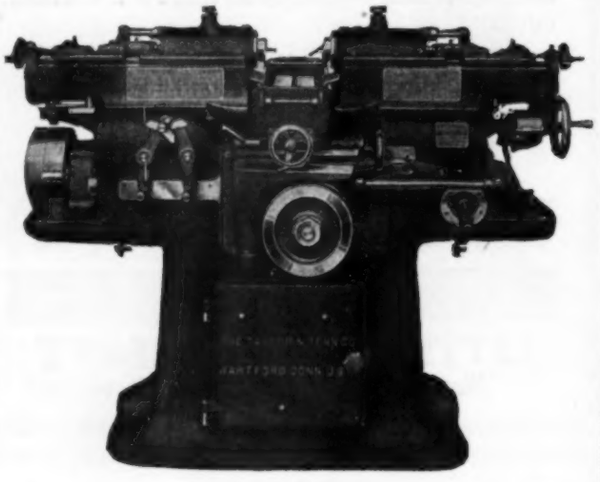

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A machine having many new and valuable features described in the circular.

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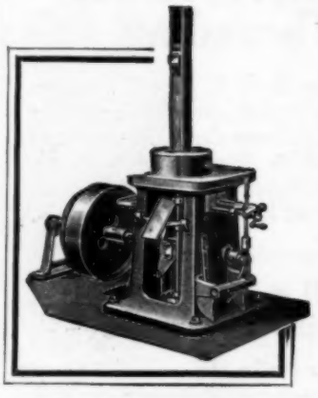

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It is a machine that for many years has stood out as an example of very speedy operation coupled with simplicity of set-up and precision. Cuts any type keyseat, straight or tapered.

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In our Engine Repair Department are men who are familiar with every manner and type of engine breakdown. These men make up the

UNDERWOOD Wrecking Crew

Members of the crew are on the job at all hours awaiting the call to duty—which duty involves the truing-up, repairing or overhauling of engines, no matter where, *nor when!*

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Established 1870 **Philadelphia, Pa.**

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Large millers have the tasks no other miller can handle. The No. 2 Standard Miller takes care of toolroom work, odd lot milling and general manufacturing. They are high grade, speedy producers and the price is right

Ask for full details.

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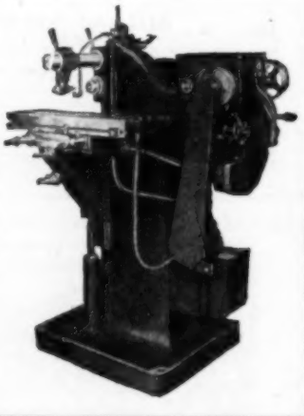

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No. 1 Improved Upright Shear.

We are large manufacturers of all kinds of bolts and nuts and have developed these machines for our own use. They, therefore, meet every requirement of bolt and nut making and have advantages and improvements that result from our intimate knowledge of this work. Write today for complete details of these machines.

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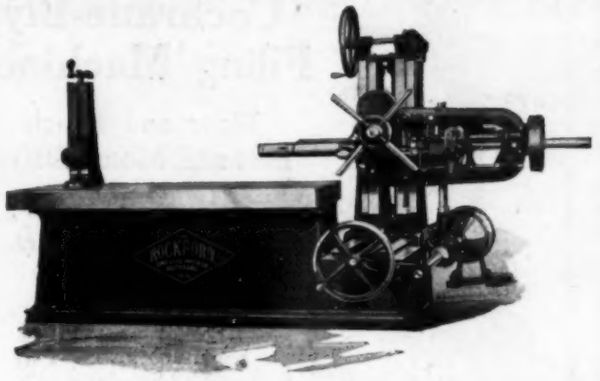

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Note this Wide Range Machine

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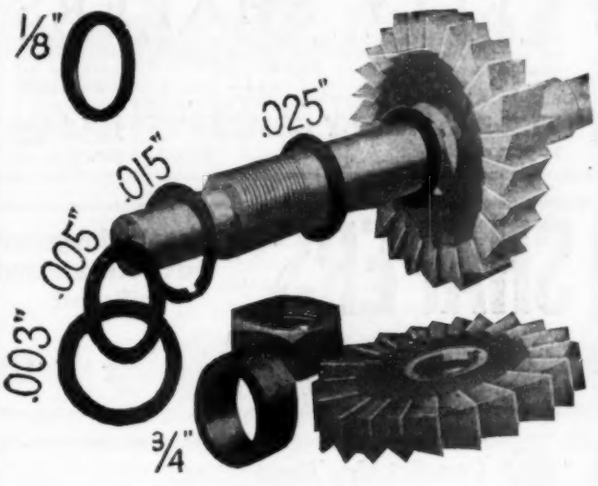

Spacers for Milling Machines Arbors, etc.

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VERSATILITY: The table of this machine can be swung to either side of horizontal, rigidly clamped and work can be milled, drilled, reamed, and bored.

You can readily see what a great variety of work the Knight will cover, with a feature like this.

Let us tell you what others are doing on the Knight.

Frequently an Entire Job can be completed at the Original Setting.

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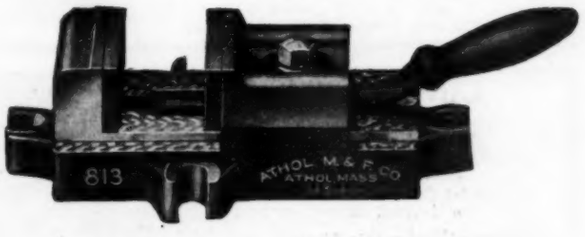
Athol Drill Press and Milling Machine Vise



This ATHOL-STARRETT Vise will take the place of an expensive jig or fixture on a big majority of your drilling and milling jobs. It possesses a range of 4 inches. By attaching special jaws it is readily convertible into a reliable holding device for all manner of work.

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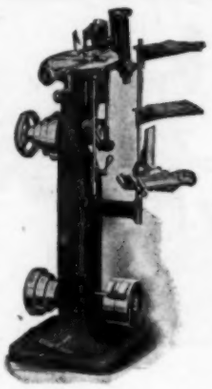

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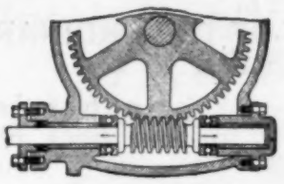
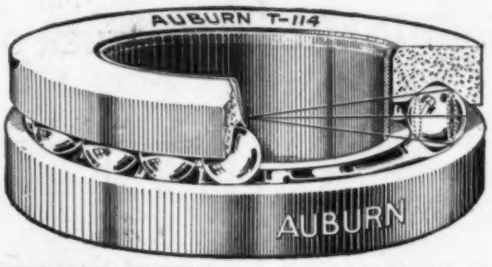


Fig. 1.



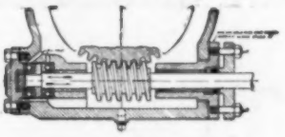


Fig. 4.

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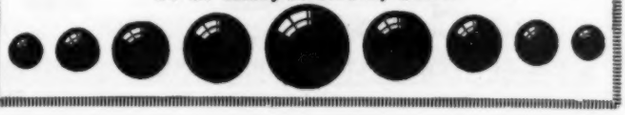

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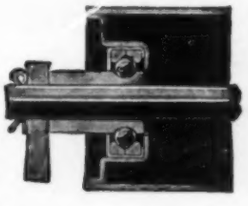

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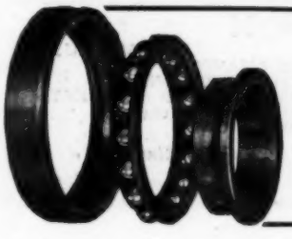

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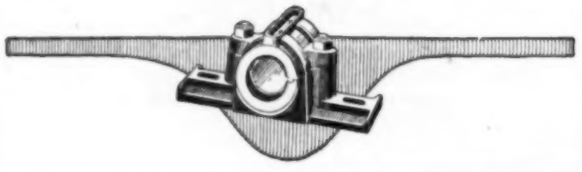
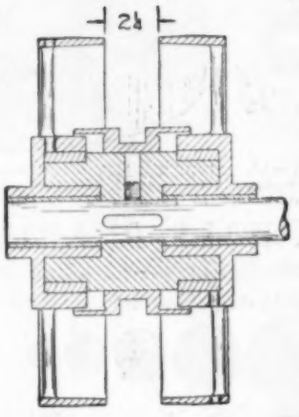


THE JOHNSON FRICTION CLUTCH
in
ANOTHER OUT-OF-THE-ORDINARY DRIVE



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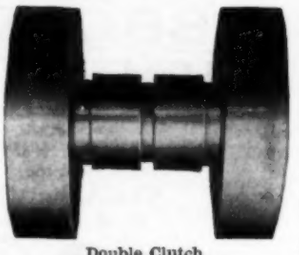

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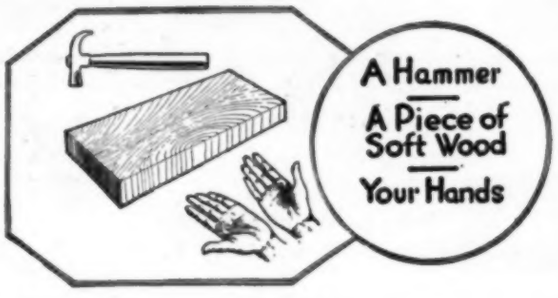
Easily and Quickly Applied With Just



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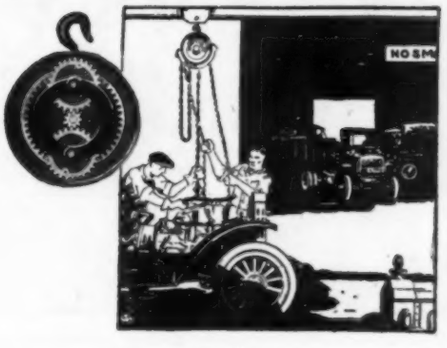

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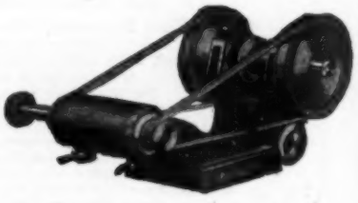

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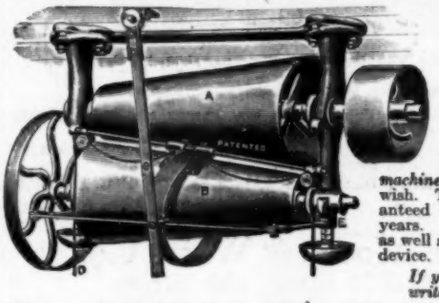

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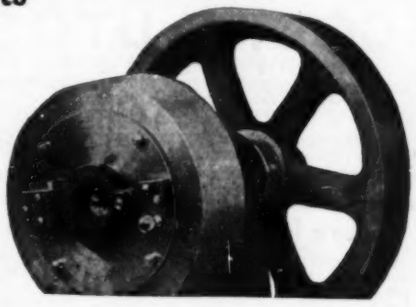

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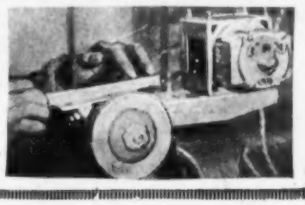

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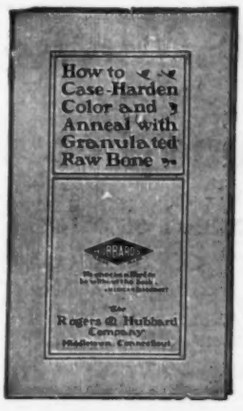

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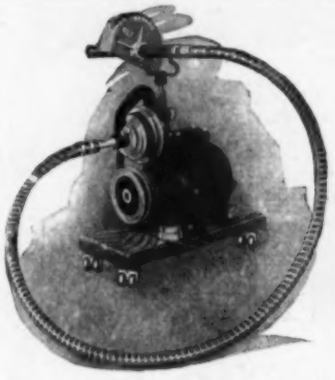

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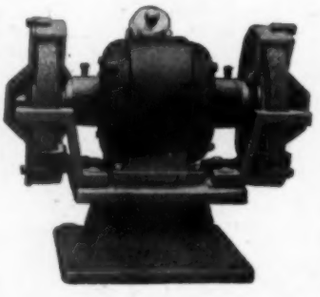

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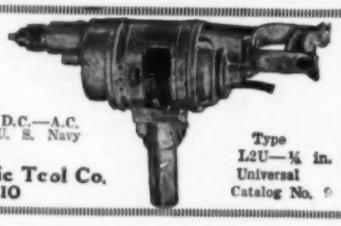

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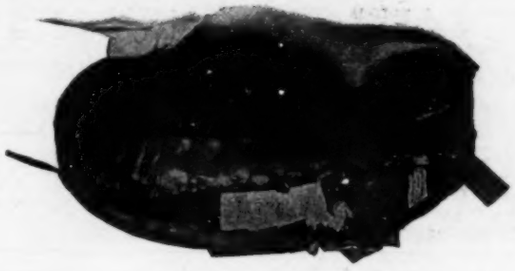

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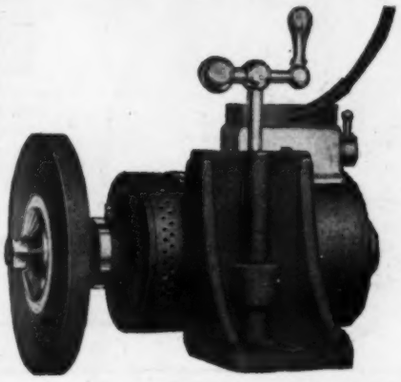

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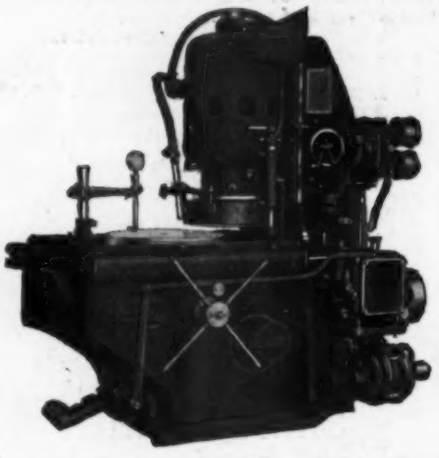

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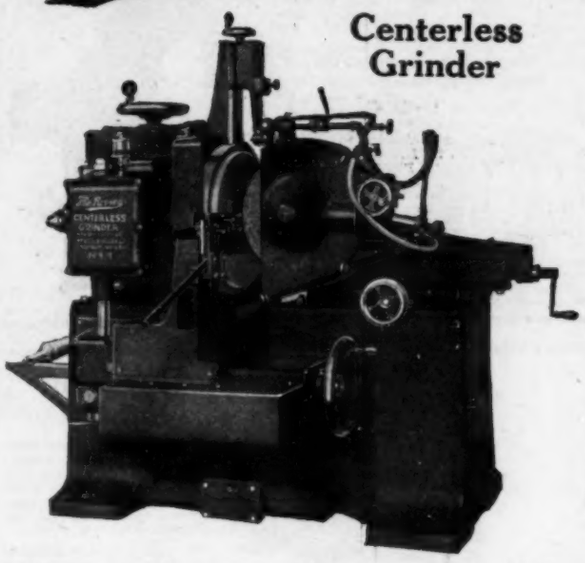

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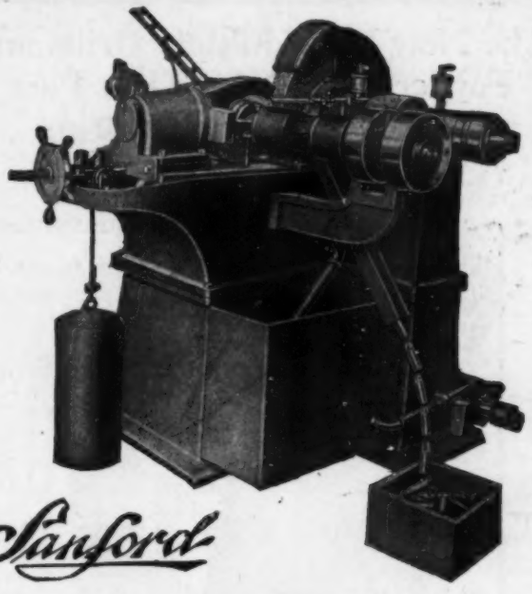

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Working on Piston Pins ⅞ in. diameter x 3½ in. long; removing .012 in. two cuts, the **Sanford Centerless Grinder** has attained a delivery speed of 500 pins per hour.

Think of the saving that could be effected in your shop costs with similar performances. Moreover, the Sanford has no complicated adjustments, simply set the three point contact and feed the work from a chute.

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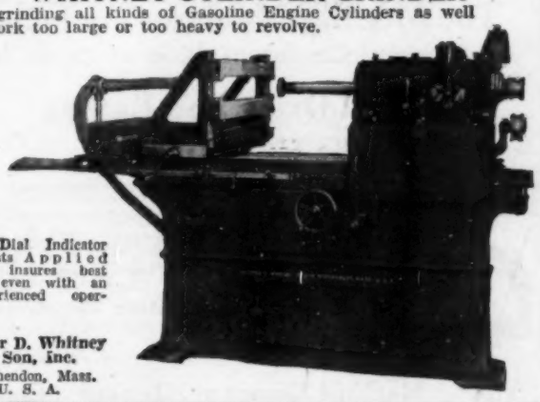
For grinding all kinds of Gasoline Engine Cylinders as well as work too large or too heavy to revolve.



New Dial Indicator (Patents Applied For) insures best work even with an inexperienced operator.

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(Made in Italy)

Where Exactness is a Heritage

In the Italian factory in which R. I. V. ball bearings are made are workmen to whom exactness is a heritage and accuracy the habit of ages.

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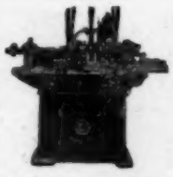

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Universal Grinding Machines
for Cylindrical, Surface, Internal, Disc, Tool and Cutter Grinding.

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Vertical Boring and Drilling Machines
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The New Fox Multiple Drills and Tappers Are Doing Their Part As Never Before To Bring Down Costs

We Guarantee

Highest production of any machine on the market.

Unequaled Work

of this kind makes the new Fox Drills a keystone in the production plans of all modern plants.

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Formerly of Grand Rapids, Mich.

Power Transmission And Lubrication Approach Perfection

Our latest **ALL Geared** and **Self-Oiled** Drilling Machine is a revelation in accuracy, speed and power output.

No troublesome belts or cone pulleys. **Wear reduced to the minimum**

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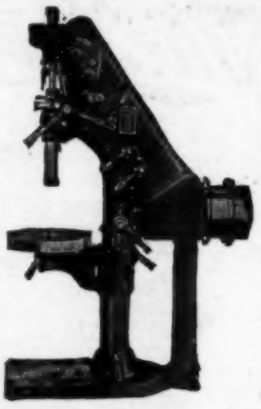

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830 Chestnut St., Rockford, Ill., U. S. A.

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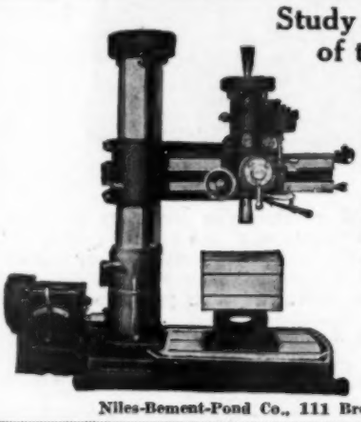
Study the Anatomy of this Radial



Note well the heavy base and column, the ample bearing surfaces of the arm; the compact head construction and the convenient positions of all controls.

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"ABRASIVE" SURFACE GRINDING MACHINES

Either Horizontal or Vertical Spindle Type, Countershaft or Motor Drive

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The Quint No. 4, 32-in., six spindle Turret Machine, bores, drills and taps. Saves time on series operation jobs. Also built with four spindles.

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Various sizes, both Power Feed and Hand Operated, for work up to 54 inches in length.

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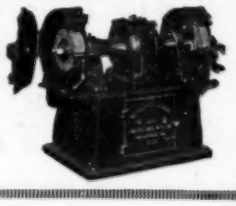
Built to give unfailing service at minimum cost. Write for the full details. You'll be interested.



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Internal Grinding
SPINDLES

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Equipped with Parker High Speed Ball Bearings.

Let us send you literature. Let us tell you how these spindles have saved thousands of dollars for others, and how they can do the same for you.

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A Range of Three Speeds

The New line of Sigourney Ball Bearing Drill Presses possesses numerous features that commend them to your use. The range of three speeds fit them to meet your most urgent production demands and their true running features guarantee accuracy.

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Drill Presses

are made in single, double, triple, quadruple spindle and bench types. Fitted with No. 1 Morse Drill Taper and provided with clamp stops that may be instantly adjusted to meet any desired hole depth.

All bearings are the standard commercial type ball bearings thus simplifying replacements when necessary.

Perfect balance is a feature in these machines.

Ask us about this new line of Drill Presses. We can also furnish plain bearing machines.

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Rigid inspection guarantees perfection

Only by the adoption of a most exhaustive system of inspection and working tests has it been possible to obtain and maintain the high standard that has been set for all **L-G Drilling Machines.**

There is a Final Test and Inspection Sheet for each machine. On this sheet is listed all of the possible troubles that might be found. Each one of these must be inspected and checked on the sheet. This insures nothing being overlooked. The original sheet is filed in our office, the duplicate accompanies the machine. All parts and partial assemblies in addition are carefully inspected in process.

L-G Machines are bound to live up to the great things we claim for them.

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BUILT IN FOUR DIFFERENT SIZES

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Fits Any Spindle Drills Any Pattern

3 to 12 HOLES. Built for fast production.

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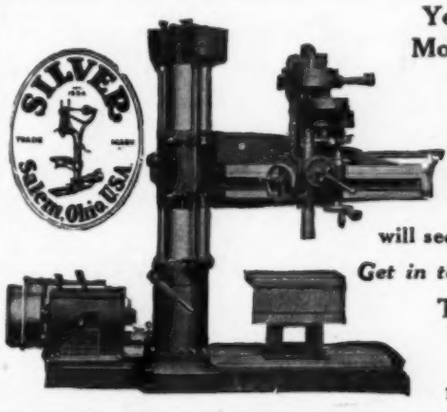

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FOR PRODUCTION!

Leading manufacturers of Single and Multiple Spindle Drilling Machines, Cylinder Boring Machines, etc., and various types of special equipment.

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Hoefer Drillers and Auxiliary Drilling Heads drill their way through doubtful times with a degree of economy that speeds the coming of better business to your shop. *Hoefer* is the pass-word that admits better drilling methods. *Put it up to Hoefer and put it over.*

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Highest Efficiency—Utmost Economy

"Hole Hog" Multiple Drillers and Borers increase the output and reduce production costs. Save in every direction. Increase the capacity of your plant by using "Hole Hogs" instead of building an addition. Tell us your needs.

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High Speed Ball Bearing Sensitive Drills and Heavy Duty Radials

Advanced design and high grade construction make them the logical tools to use for efficient, low cost production. Investigate.

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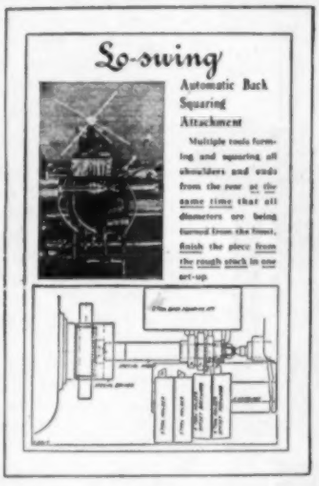
So-swing



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Hand Operated
For Chucking and Bar Work

AUTOMATIC TURRET LATHES
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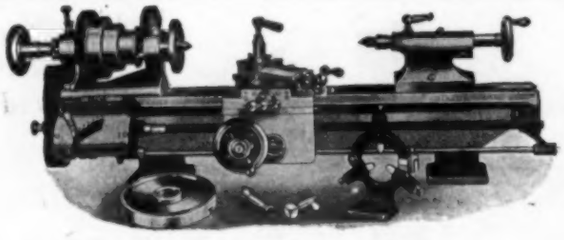
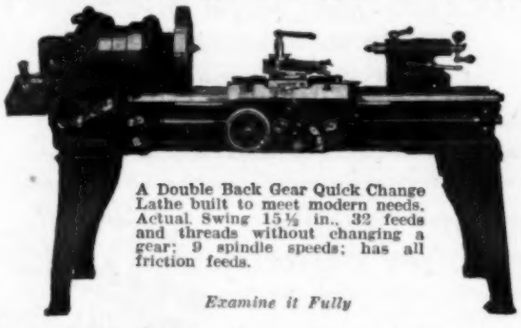


Wade Tool Makers' Lathe

Swings 8½ in., 24 in. between centers, accurate lead screw, Automatic cross feed, quick change gear box, tool steel bearings, head and tail spindle hardened ground, lapped.

Wade-American Tool Co., Waltham, Mass.

A Remarkable 14-Inch Lathe for $450.00!



A Double Back Gear Quick Change Lathe built to meet modern needs. Actual Swing 15½ in., 32 feeds and threads without changing a gear; 9 spindle speeds; has all friction feeds.

Examine it Fully

The Carroll & Jamieson Machine Tool Co.
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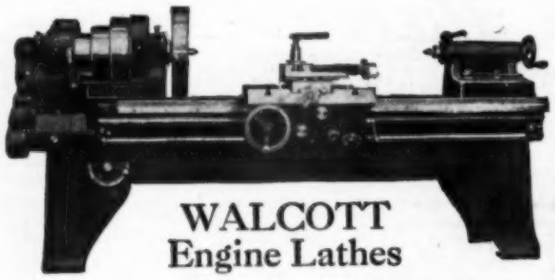

WALCOTT Engine Lathes

A High-Grade Lathe—at Low Cost!

WALCOTT LATHE CO.
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Adaption to Circumstances as Expressed By HJORTH LATHES

No matter what job comes along, within the range of light machine work, you can handle it efficiently on the **Hjorth Precision Bench Lathe.** The very complete list of attachments give this machine quite unusual range.

Our catalog makes interesting reading. Have you a copy?

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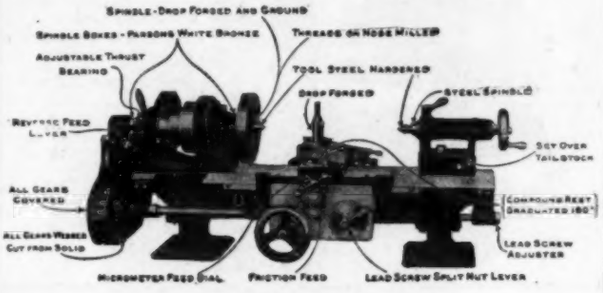
Type B-4 "DALTON SIX"

METAL WORKING LATHE

THE SMALL LATHE for the BIG JOB

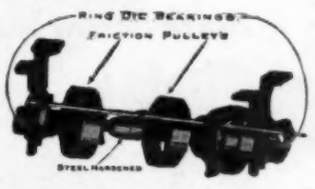


Standard Bench Type

Swings 7¼ inches
Turns 13 inches, 30 in. Bed
Cuts Threads 3-144.

Price
$125.00 Net

Complete as illustrated, including set of change gears and wrenches. F.O.B. Factory. Furnished also on High Legs; also Foot Power or Motor Driven.



Can be applied to either ceiling or wall

This machine can be furnished with Bed 36 inches long, at extra cost

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Sound Beach, Connecticut

CABLE ADDRESS: "ALEDAL" STAMFORD, CONN., U.S.A.

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Every Part a Real Working Unit

Every live machinist likes honest to goodness tools, free from "lace," and made to work without fuss.

That's why **Flather Lathes** are in high standing with the men who use them—the men whose judgment, of a machine's working qualities, is valuable.

There is a type built for every purpose, but no matter which you select, you'll get value in the tool and in its work.

Will be glad to advise. Send us your requirements.

Flather & Company, Inc.

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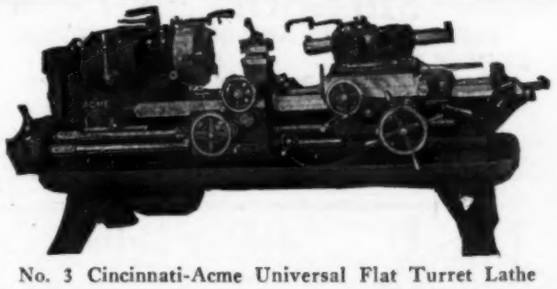

No. 3 Cincinnati-Acme Universal Flat Turret Lathe

Cincinnati-Acme

The need to kill *more than* two birds with one stone

In recent years it has become increasingly important that the greatest possible number of operations be concentrated on the one machine. This is because labor is by far the most expensive item on the production sheets and each extra tool means extra labor.

Under competitive conditions it is very clear that the man, who can beat his opponents on production cost, is the man who can beat them in the markets.

It will cost you nothing to investigate the merits of C. A. Turret Machinery and it will point out a way to the reduction of your overhead.

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The Acme Machine Tool Co.

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Manufacturers of Cincinnati-Acme Turret Machinery

The operator's ideal for handy, instant control—unlimited power—rigid precision.

BRADFORD Geared Head Lathe

Gears cannot be shifted under load. Feed rod and lead screw cannot be engaged simultaneously. The few speed and feed controlling handles are placed where the operator instinctively reaches for them. No electric brake or electric control of any kind is necessary.

Besides the famous Bradford low drive principles with its "down pull" and shock-absorbing gears, eliminates the chatter common to geared-head lathes, and preserves Bradford precision noted for a quarter century against years of heavy cuts and fast feeds.

Get Bulletin No. 25 Today

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Cincinnati, Ohio, U. S. A.

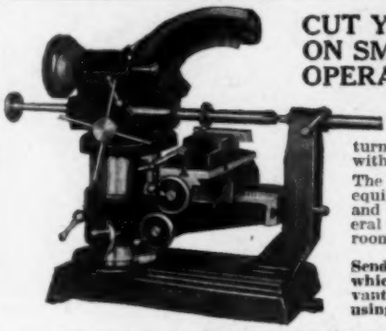
It is literally true that the best is cheapest

The *A. V. Carroll 16-inch Lathe* offers remarkable value. It is built throughout to conform with the best and most up-to-date practice. Specifications include all-steel gears in gear box and apron; 16½-inch swing over ways and 19-inch swing over new invisible bed gap. Price $478.00.

14-in. Quick Change Gear Lathe

A. V. Carroll Machine Tool Company

Norwood, Cincinnati, Ohio



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The most universal machine for small work. Either milling, turning or drilling done with utmost precision.

The TRIPLEX is a splendid equipment for experimental and model shops. Also general machine shops and tool rooms.

Send for our Circular No. 1 which describes the advantages and economy of using the TRIPLEX.

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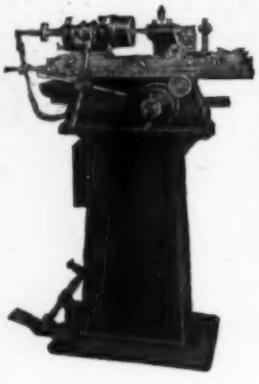
All TRIPLEX Products are manufactured by B. C. AMES CO., Waltham, Mass.

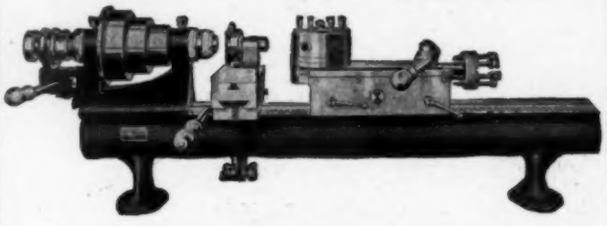


If you have a quantity of small holes to grind at a high rate of production, consider the Rivett No. 103 Internal Grinder. It will probably solve your problem. Our prices practically equal those of 1915.

Dealers in principal cities to serve you.

Rivett Lathe and Grinder Company
Brighton District of Boston, Mass.

Stark Screw Machine Unit



Produces work rapidly, of utmost accuracy. New Turret, with automatic stops. Five sizes ⅜ in. to 1¼ in. collet capacity.

STARK TOOL COMPANY, Waltham, Mass.
Established 1862 *Originators of the American Bench Lathe*

Milliken 11 inch Slide Rest

possesses several points of excellence. Especial attention is called to our new method of securing rest to base, which allows the rest to swivel and which holds it firmly in any position. This is accomplished by a taper hub on rest and a corresponding orifice in the base with a sliding segment clamped by two collar screws shown. The bearing surfaces are scraped and this slide rest is nicely finished all over.

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Also makers of Ball Turret Heads Angle Plates, etc.

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MILLHOLLAND
TURRET LATHES AND SCREW MACHINES
MODERN DESIGN—
DISTINCTIVE OPERATING ADVANTAGES
Built for a big day's work every day.
MILLHOLLAND MACHINE COMPANY
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Sidney Lathes

SIDNEY SERVICE

Good Machines
All Types
Real Service
Right Prices
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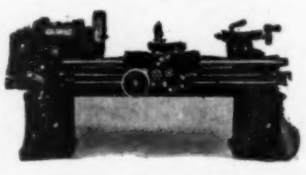
Sidney Machine Tool Co., Sidney, O.

STEINLE TURRET LATHES

A modern high power, high duty production turret Lathe for bar or chucking work. Designed and built sufficiently powerful and rigid to enable use of greatest number of multiple cutters and thus insure rapid, accurate and economical work. Why not write us for full particulars.

STEINLE TURRET MACHINE CO.
MADISON, WIS. U.S.A.

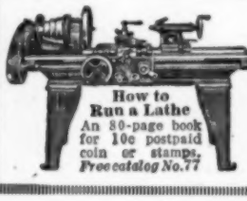


Quick Change Gap Lathes 14 in. - 23 in. to 30 in. - 30 in. swing, an addition to

MONARCH'S

Regular Line. Quick Change Engine Lathes, 10 in. to 30 in. swing.

The Monarch Machine Tool Co.
107 Oak St., Sidney, Ohio

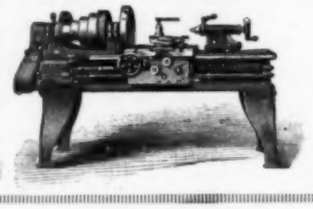


How to Run a Lathe
An 80-page book for 10c postpaid coin or stamps. *Free catalog No. 77*

SOUTH BEND LATHES

Size of Lathe	Standard Change Gear	Quick Change Gear
9 in. x 3 ft. Lathe	$176.00	$216.00
11 in. x 4 ft. Lathe	228.00	273.00
13 in. x 5 ft. Lathe	304.00	354.00
15 in. x 6 ft. Lathe	376.00	431.00
16 in. x 8 ft. Lathe	452.00	512.00
18 in. x 10 ft. Lathe	656.00	721.00
21 in. x 12 ft. Lathe	933.00	1,016.00
24 in. x 14 ft. Lathe	1,254.00	1,353.00

SOUTH BEND LATHE WORKS
422 Madison St., South Bend, Ind.



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QUALITY
ACCURACY
PRICE
LATHES

13-15-17-19 in. Swing
Champion Tool Works
Cincinnati, O.

CROSS

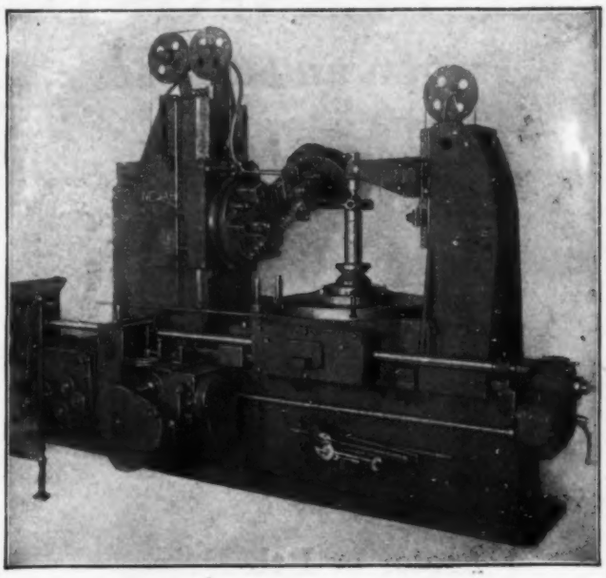
Gear Tooth Rounding Machine

This machine will round off the teeth of intermeshing spur gears to a perfect half circle. The only machine we know which will give high production in this work.

Details on request

Cross Gear & Engine Co.
Detroit

NEWARK GEAR



Newark Hobbing Machine

The growing use of herringbone-gears demands that they be cut on the proper machine.

The NEWARK Hobbing Machine is designed just for such work as herringbone and helical gears. It saves time in setting up and in cutting; and time represents money. The gears are cut with the greatest accuracy.

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Henry E. Eberhardt, President
65 Prospect St., Newark, N. J.

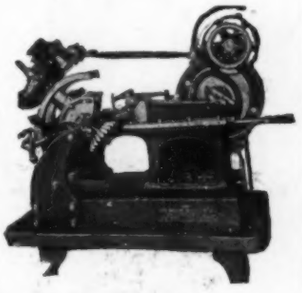
Gear Cutters—Gear Hobbers

For Spur and Spiral Gears

A complete line of automatic machines for automotive and industrial requirements.

The Cincinnati Gear Cutting Machine Co.
(Subsidiary of The Cincinnati Shaper Co.) Cincinnati, Ohio

Gears Cannot Be "Broken In"



Either they are efficient to start with or they never will be efficient.

Bilgram Bevel Gear Generators will ensure the perfection of the gears in your product—will make them a definite selling point.

If, on the other hand, you use ready cut gears, we have unusual facilities to fill your requirements in all types.

Write us about your gear problems.

The Bilgram Machine Works
1233 Spring Garden St., Philadelphia, Pa.

Pipe Cutting and Threading Machines
Bolt Threading Machines

"Better Threads at Lower Cost"

WILLIAMS TOOL CORPORATION
Canadian Plant, Brantford, Ont. ERIE, PENNA.

Libby Turret Lathe

A superior machine made by a man who is familiar with machine shop requirements. Machine is strong, powerful and rigid. Adaptable to entire range of heavy bar and chuck work. Let us give you full details.
International Machine Tool Co. Indianapolis, Ind.

Adams-Farwell
GEAR HOBBERS

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THE ADAMS COMPANY 1910 Bridge St. Dubuque, Iowa, U.S.A.

Rapid Production **HAMILTON** *Machine Tools*

Hamilton Lathes, built in a wide range of sizes and styles, reach the peak of modern precision—plus—production. Their economy, viewed from any angle, makes it advisable for you to get complete description at once.

THE HAMILTON MACHINE TOOL CO.
Hamilton, Ohio, U. S. A.

PIPE THREADING AND CUTTING MACHINERY

All Sizes ⅛ to 18 in. inclusive

D. Saunders Sons, Inc., Yonkers, N. Y.

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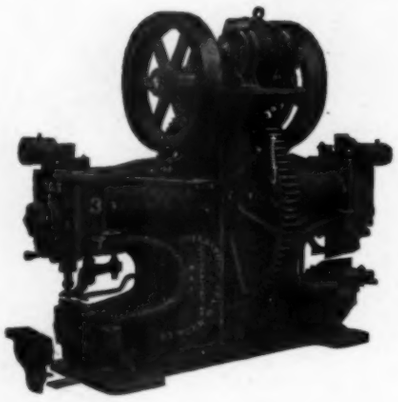
ROYERSFORD
Punch and Shears



Motor or Belt Drive.

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Royersford Foundry & Machine Co., Inc.

Factory: Royersford, Pa.

As Sensitive as a Tack Hammer

The Bradley Compact Hammer completely satisfies the need which arises in many shops for a medium powered hammer of small dimensions which can be operated at high speed.

The length of stroke, strength and speed of the blow can be regulated within very fine limits, while the rubber cushions protect the machine and forging from damage.

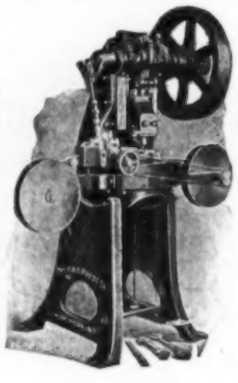
Following exclusive Bradley practice the anvil block is adjustable for the perfect alignment of dies.

Bradley Hammers are the choice of leading machine shops throughout the World. They can give *you* better forging.

Write us your requirements and we will make full recommendations.

The Bradley Compact Hammer

C. C. Bradley & Son, Inc.
Syracuse, N. Y.



Stamp Out Your Metal Blanks With a V & O Press

Automatic feed attachment permits stamping small metal blanks at a rapid rate.

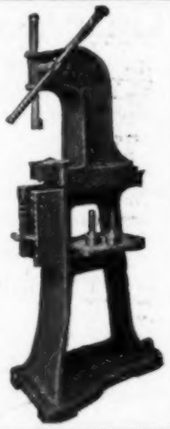
The stock and scrap rolls are made integral with the press. No wasted, cluttered-up floor space.

Write for Bulletin A-6

The V & O Press Co.
Main Office and Factory:
Glendale, Brooklyn, N. Y.
Branch Sales Office:
549 Washington Blvd., Chicago, Ill.

Here's What You Can Do—

For broaching, bending and punching; for short, precise pressing or long hole pressing, you need



NICHOLSON Arbor Presses

Their design, materials and workmanship assure unerring accuracy over long periods. Made in capacities up to 9,000 pounds pressure. Let us tell you about them, also about the advantages of

Nicholson Expanding Mandrels

W. H. Nicholson & Co.
114 Oregon St., Wilkes-Barre, Pa.

SHEAR BLADES
THE CLEVELAND KNIFE & FORGE CO.
CLEVELAND, OHIO

Gray's Sheet Metal Cutter Cuts Shapes Like These

Made in four sizes for cutting shapes from ⅛, 3/16, ¼ and 5/16-inch plate.

W J. SAVAGE COMPANY, Inc.
Knoxville, Tenn.

THE LONG AND ALLSTATTER CO.

POWER PUNCHING & SHEARING MACHINERY

AMERICAN PUNCH & SHEAR WORKS — THE QUALITY LINE

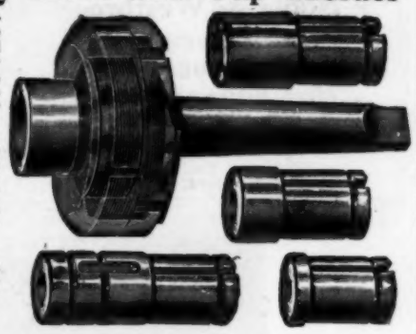
HAMILTON, OHIO, U.S.A.

The Safety Drill and Tap Holder

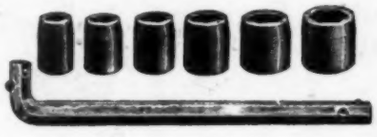
is the only attachment for the purpose that gives universal satisfaction and is Unequaled for Efficiency, Convenience, Rapidity, Accuracy and Simplicity.

Can be furnished with special sockets with friction set to carry one or two sizes of taps, useful if sizes are constantly changing.

Nothing to *break* or get out of *order*. Made in 4 sizes covering from 0 to 2½ in diameter.



The Beaman & Smith Co., Providence, R. I., U. S. A.
Builders of Boring and Milling Machines, and Special Machines for such Purposes Constructed.



No. 15 Bag Set
Includes 6 Allen-process hexagon sockets with "L" handle, assembled in heavy duck bag. Handle fitted with spring friction balls to hold sockets in place when in use. Sockets chamfered for close work; guaranteed against breakage. List price, $1.50.

"BAY STATE" WRENCH SETS

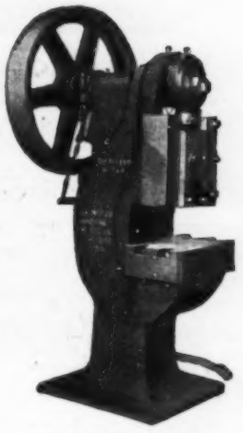
with Allen-process sockets come in combinations covering every wrench requirement of mechanics and car owners, millwrights and erectors. Box Sets and Bag Sets—embodying all the features of high-grade mechanics' tools in the handiest possible combinations. Write for booklet and the story of Bay State sockets.

THE ALLEN MFG. CO., 129 SHELDON ST. HARTFORD, CONN.

THE

"TOLEDO"
PUNCHING PRESSES

THE "TOLEDO" Punching Presses are especially suited for punching, shearing and cutting out blanks of heavy metal—steel, iron, brass, etc.; for operating trimming and forming dies used in the manufacture of automobiles, motor cycles, bicycles, cutlery, sewing machines, typewriter parts, agricultural implements, etc., switchboard parts and numerous other articles formed from bar and sheet metal.



"Toledo" Punching Press, No. 34-P

"PRESSES FOR EVERY PURPOSE"
Estimates furnished—correspondence solicited

The Toledo Machine & Tool Co.
Toledo, Ohio
Chicago Office: Room 611 Machinery Hall, 549 W. Washington Blvd.

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Increase Repair Bills and Shorten the Life of Your Hydraulic Equipment.

STOP THIS EXPENSE WITH AN

ELMES

SHOCK ALLEVIATOR

Special Machinery Built to Order

CHARLES F. ELMES ENGINEERING WORKS
1001-1013 Fulton St. "Since 1851" Chicago. U.S.A.

The Skill is All in the Machine

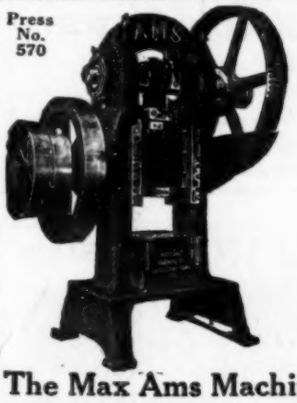
ROTARY SWAGING is the modern and economical method of forming solid or tubular circular metal sections without waste of stock. The Langelier Swaging Machine reduces or tapers to a circular section, square, round, hexagonal or similar shapes, hot or cold. We build special swaging equipment for Tungsten Filament Wire.

Our policy is to equip the machine in every detail with work holding and feeding devices that will enable them to give the most efficient service with unskilled help at a low upkeep cost.

Machines built to date have capacity ranging from a pin point to 2½ in. diameter on solid stock and to 6 in. on tubing.

LANGELIER MFG. COMPANY
Arlington, Cranston, R. I., U. S. A.

Press No. 570



PRESSES

Large or small
Regular or Special
The last word in Presses is

"AMS"

Look for it.
It's your security.

The Max Ams Machine Co. 101 Park Avenue New York City, N. Y.
Chicago Office: 20 Jackson Blvd. Rochester Office: 705 Commerce Bldg.

Bolt and Pipe Threading Machinery

Let our Engineering Department solve your threading problems. Send your specifications today.

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Waynesboro, Pa., U. S. A.

Correct Broaching Can Cut Costs

Our modern plant equipped to specialize in broaches ensures a measure of service hitherto unobtainable.
An entirely new heat treating process gives freedom from distortion, carbonization and scaling, also a much keener and longer wearing edge to our tools.

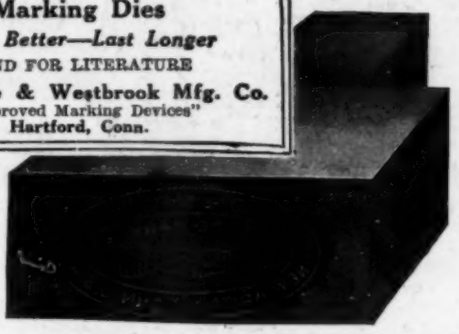
We can save you money on broaching. Write us.

Paramount Broaches

Paramount Specialty Tool Company
River Street, Waltham, Mass.

PARAMOUNT P.S.T.C.O. QUALITY

Noble & Westbrook
Steel Stamps and Marking Dies
Mark Better—Last Longer
SEND FOR LITERATURE
The Noble & Westbrook Mfg. Co.
"Improved Marking Devices"
Hartford, Conn.



50% Added Efficiency to Screw Machines

You can increase the output of your screw machines at least 50 per cent by turning over the light tapping and countersinking to an

Anderson Dial Feed Tapper

The machine which can handle such operations at a speed up to 3600 per hour.

Write for Details

Anderson Die Machine Co.
Bridgeport, Conn.

For the Architect, Engineer and Draftsman:

Blue, Brown and Black Print Papers and Cloths, Tracing Papers and Cloths.

Single Action Vacuum Print Frames, T Squares, Triangles, etc. Nybink—Waterproof Inks.

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"Buffalo"

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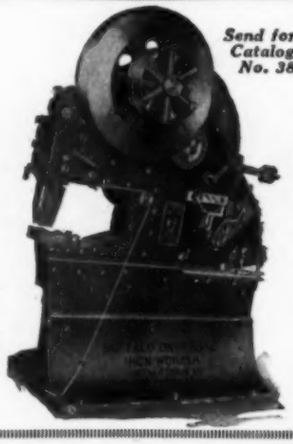
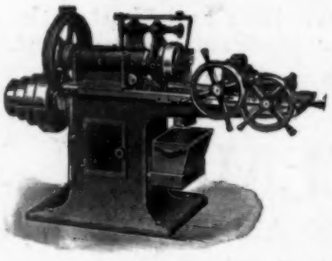


Universal Iron Worker

punches, shears and acts as a bar cutter, a great time Saver as many parts are cut in special holes.

Buffalo Forge Co.
448 Broadway, Buffalo, N. Y.

Strength and Weight



help to give Acme Bolt and Nut Machines their undoubted superiority as immediate cost reducers on all work in their capacity.

They turn out work faster than others and perfect accuracy can be depended upon. Write us for description of our entire line. Catalog?

THE ACME MACHINERY COMPANY
CLEVELAND, OHIO, U. S. A.

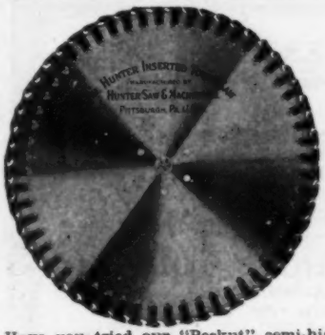
FERRACUTE PRESSES
HUNDREDS OF SIZES AND STYLES
FOR CUTTING, FORMING, PUNCHING, DRAWING AND EMBOSSING BAR AND SHEET METALS, PAPER, LEATHER ETC.
FERRACUTE MACHINE CO., BRIDGETON, N. JERSEY, U.S.A.

Lea Simplex Cold Saws
Fast—Easy to Operate—Large Capacity
Minimum Waste of Stock
Designed, Manufactured and Sold by
The Earle Gear & Machine Co.
Philadelphia, Pa., U. S. A.

PRESSES and SHEARS
Sheet Metal Working Machinery
THE D. H. STOLL CO., Inc.
Military Road and Lancing St., Buffalo, N. Y.

HACK "STERLING" SAWS

Diamond Saw & Stamping Works, Buffalo, N. Y.



HUNTER SAWS

All Types of Circular Saws for Cutting Metal

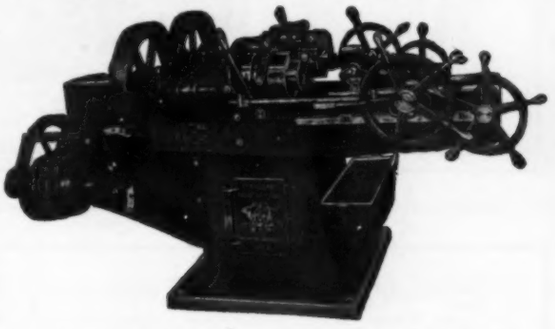
Inserted tooth saws, solid tooth milling saws made of chrome alloy, semi-high and high-speed steels, hot saws, friction discs. Saw sharpening machines.

Have you tried our "Beskut" semi-high speed milling saws? They will cut costs on hard jobs.
We also manufacture and carry in stock a full line of Pneumatic Hammer rivet sets and chisel blanks.

HUNTER SAW & MACHINE CO., Pittsburgh, Pa.

The "STANDARD" Double Bolt Cutter

Column and headstock are cast in one piece, assuring permanent alignment and rigidity. Will stand up and do perfect work under the most trying conditions. Six sizes: 1½ in., 2 in., 2½ in., 3 in., 3½ in., 4 in.



Improved Die Head and Control Exclusive and Superior Design

All parts strong and substantial yet micrometer adjustment or set is so sensitive that bolts may be cut *over* or *under* size and dies set to again cut *exact* size—at will of operator, while machine is running, adjustment not affected by opening or closing of dies. Feed is automatically stopped when desired length is cut.

Circular gives details—write for it.

The Universal Machine Company
Pike St., Bowling Green, Ohio

The

HIGLEY

Cold Metal Saw

Catalog will be sent on application to

Vandyck Churchill Company
52 Vesey Street, New York

The "MARVEL" No. 8 Metal Band Saw

THE large number of satisfied users of this high-grade saw like it because of the large capacity, the great variety of work it handles, that it saws at an angle right or left, that the work is held stationary and blade feeds itself forward into the work.

They like the large, roomy bed or work table. It solves their sawing problems.

Let us tell you more about the "MARVEL" No. 8.

Armstrong-Blum Mfg. Co.
347 N. Francisco Avenue, Chicago

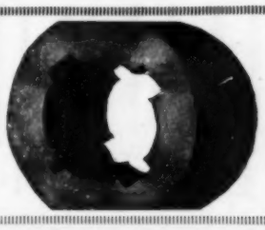
The No. 8 Marvel Band Saw

Have Us Broach It

Broaching cuts cost on keyways, splines, oil grooves, gear teeth, and countless regular or irregular shaped holes. Send your problems to the originators of commercial Broaching

Remember—"Lapointe of Hudson"

Lapointe Machine Tool Co.
Hudson, Mass.



SAW FILERS AND GRINDERS

FOR ALL WOOD AND METAL CUTTING SAWS
THE WARDWELL MFG. CO.
111 Hamilton Ave. *Saw Sharpening Machinery* Cleveland, Ohio

QUALITY

"True to the Name"

Made of the finest tungsten steel by specialists of many years' experience. Specify "QUALITY" on your next order and settle your Hack Saw Problem.

NAPIER SAW WORKS, INC.
(The Hack Saw Specialists) Office and Factory: Middletown, N. Y.

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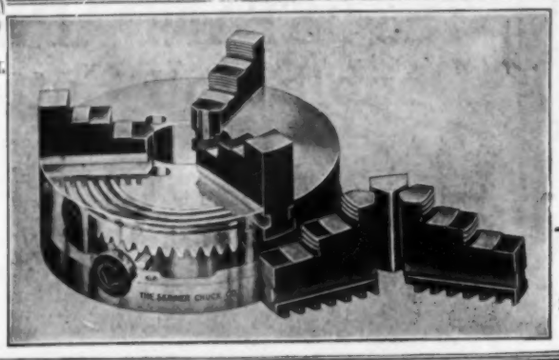


SKINNER UNIVERSAL CHUCKS
Geared Scroll Type

The ideal chuck for repetition work. It insures a powerful grip. The jaws operating universally can be tightened by applying the wrench to any single pinion. For general manufacturing purposes the Skinner Geared Scroll Chuck has no equal.

Illustrated literature and catalogue upon request

THE SKINNER CHUCK COMPANY
NEW BRITAIN, CONN U.S.A.

ESTABLISHED 1887

New York Office: 94 Reade Street — San Francisco Office: Rialto Building — Chicago Office: 552 West Washington Blvd.
London Office: 139 Queen Victoria St., E. C. 4

Waiting to get their Teeth in

There are **Whiton Chucks** just waiting to get their jaws around your work. Perhaps you do not fully realize their advantages.

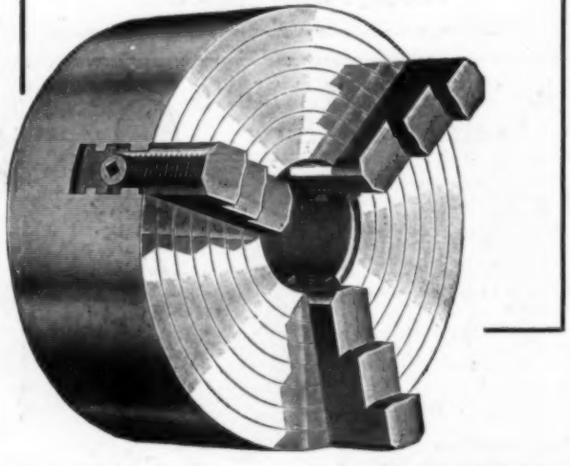
The body, for instance, is cut from a solid block of steel. This means that there are no weak spots and no seams to open up under heavy cuts. The jaws are unusually heavy, are reversible and can be operated either independently or universally. The scroll mechanism is simple and solid.

In fact, we never knew a Whiton that failed.

Get the catalog. It's valuable.

D. E. Whiton Machine Company
New London, Conn.

European Address: Selson Engineering Co., Ltd., 85 Queen Victoria St., London, E. C.
"Whiton" Chucks are sold and kept in stock by principal dealers all over Europe



BUILDING FOR THE FUTURE
On the Experience of the Past

The Cushman Chuck Company has been building for the future for sixty years. It is doing it to-day. This is the reason that, when the need appears for a better holding device, there is a Cushman Chuck ready to meet it.

Note the wide, strong ribs. They are ground to scroll on gauges and are aligned with absolute precision.
The New CUSHMAN THRUST BEARING
Pat. applied for.

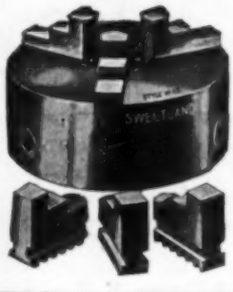
STYLE 214

The Incomparable"
THAT NEW STEEL CHUCK

Ask your dealer about it.

THE CUSHMAN CHUCK CO. HARTFORD, CONN., U.S.A.

SWEETLAND CHUCKS



of the Geared Scroll type have one inside and one outside set of jaws. These jaws are ground perfectly true on the face and bite, after being hardened.

Four jaw type if desired.

Ask us to show you the Sweetland Line.

The Hoggson & Pettis Co.
New Haven, Conn.

HANNIFIN
Production Tools—

Air Operated Chucks and Adjustable Boring Bars

HANNIFIN AERO CHUCKS M'F'G CO

Air-operated Arbor Presses, Chucks, etc.; Countershafts, Vises, Mandrels and Clamping Devices, Adjustable Boring Tools, Multiple Boring and Reaming Tools, Adjustable Reamers, Line Boring and Reaming Bars, and Cylinder Boring and Reaming Tools, Car Wheel Boring Bars.

Catalogues on Request

Hannifin Manufacturing Co.
Harrison St. and Kolmar Ave., Chicago

Jacobs Direct Chucks

Variety performance pays big dividends

The purchaser of a Jacobs Drill Chuck knows that he possesses a superior unit of drilling equipment, but he never fully exhausts its versatility, for new applications come to light daily.

In the plant of the Essex Engineering Co., Inc., a Jacobs No. 5 performs some unusually tough drilling operations, but its usefulness does not end there.

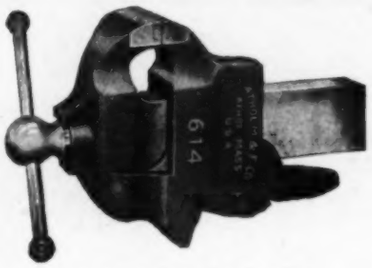
We show this Chuck doing a facing job on the bearings of a cast iron Spooling Attachment Frame that proves its design is mechanically correct and its gripping powers unusual. The closest tolerance limits are required on this work, but the Jacobs holds as steady as a miller.

Engineer W. H. Brutt of The Essex Works, states: "The Jacobs is most satisfactory for all around work."

This advertisement is published in the interests of good Drilling Equipment by the makers of the Jacobs Chuck

"Serve Well With Good Equipment"

Athol-Starrett Vises



Athol Machinists'

The CASTINGS are made in our own foundry, under chemical control, and from a special grade of semi-steel carrying high tensile and compressive strength combined with great elasticity, making it superior to any other material for vise construction. This metal is sufficiently rigid to withstand considerable strain without breaking after reaching the point at which other materials from which vises are commonly made either bend or break. The average tensile strength is 35,000 pounds—approximately 13,000 pounds in excess of the best grades of cast iron.

Ask for Catalogue 35

Athol Machine & Foundry Co.
Athol, Mass., U. S. A.

International Standard Scleroscope (Hardness Tester)

The Shore Scleroscope

is now used in hundreds of plants for its accuracy in hardness testing. It is direct reading and can readily be operated by anyone. Ranges from softest metals to hardest steels without adjustment. It is invaluable in ordering materials to specifications. The free booklet will interest you.

The Shore Instrument & Mfg. Company
Van Wyck Ave. and Carrl St.
Jamaica, N. Y.

RIGIDITY GIVES EFFICIENCY

In Rigidity and other essentials

REED VISES ARE MOST RIGID

Reed Manufacturing Company
Erie, Pa.

Randall & Stickney Indicators and Gauges

for every kind of precision measurements on duplicate parts. Quickly and easily applied. Unsurpassed in simplicity and durability.

Calibrated in thousandths of an inch or metric scale. Ideal for the rapid, accurate inspection of large quantities of work. No modern shop should be without them.

Write us today.

Randall & Stickney
Waltham, Mass., U. S. A.

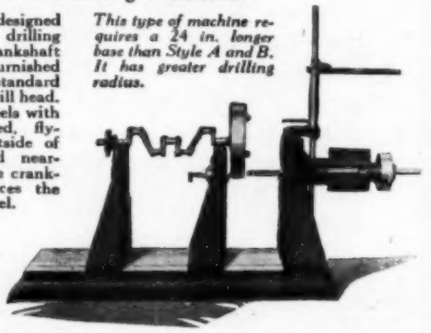
ROCKFORD STYLE "C"

Balancing and Drilling Machine

This machine was designed for balancing and drilling flywheels with crankshaft attached. It is furnished with an extra standard which carries the drill head.

In drilling flywheels with crankshaft attached, flywheel is hung outside of balancing standard nearest drill head. The crankshaft counterbalances the overhanging flywheel.

This type of machine requires a 24 in. longer base than Style A and B. It has greater drilling radius.



Rockford Tool Co.
Rockford, Illinois

Model B (Five wheels)
Model B-6 (Six wheels)

MODEL B GEAR COUNTER

will give you your accurate production. Tested 20,000 per hour.

Send for circular

R. A. HART MFG. CO., 191 WILSON COURT BATTLE CREEK, MICH.

Accurate and Reliable

BROACHES

Prompt Service—Consult us without obligation

The Hurlbut-Rogers Broach Co.
Hudson, Mass., U. S. A.
Owned and Operated by
THE HURLBUT. ROGERS MACHINERY CO.

DRILL
VISES
Drill
SPEEDERS
KNURL HOLDERS
For Turrets

The Graham Mfg. Co.
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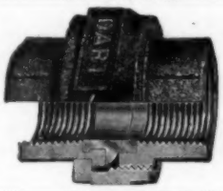


Leak-Proof Unions

Dart Unions are fitted with non-corrosive bronze seats. A free sample on request.

Write for catalog and price list No. 20.

E. M. Dart Mfg. Co., Providence, R. I.

The Fairbanks Co., Sales Agents
Canadian Factory, Dart Union Co., Ltd., Toronto.

Graduated Adjustable Friction Self-Centering

Tap Holders for Turret Lathe

TAPS STEEL as safely as Cast Iron

ERRINGTON

MECHANICAL LABORATORY

BROADWAY and JOHN ST., NEW YORK

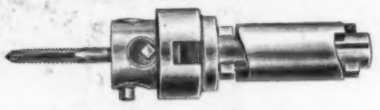
Phone Cortlandt 3149

Western Branch: Machinery Hall, 549 West Washington Blvd. Chicago

New England Branch: 831 Old South Building, Boston, Mass.

Catalog Francais: Edgar Boxham, Paris 12 Rue du Delta

Regulates the Whole Power of Machine to Just Drive, but Cannot Break Tap. When Tap Sticks (or Strikes Bottom) the FRICTION SLIPS, and Tap can thus be Run In and Out until the Toughest Metal is Quickly Tapped.



Double Clutch Sleeve

Interchangeable Spring Shanks for Rough and Finish Taps occupying One Turret Hole.

Especially Good for Roughing and Finishing Taps, Running Solid Dies Up Against a Shoulder, etc.

GARVIN HEX-SQUARE TWO-WAY FIXTURE

For Butt or Straddle milling of a square or hexagon nature.

Will clamp in either a horizontal or vertical position.

Made in two sizes:
1 in. size, ¼ to 1 in. cap.
2 in. size, ¼ to 2 in. cap.

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THE GARVIN MACHINE COMPANY

Spring and Varick Sts. 50 Years in NEW YORK CITY

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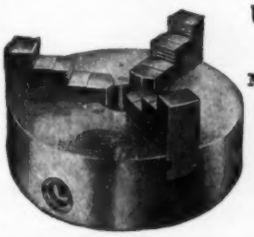
Union Chucks are always "up to the minute." Our entire efforts are devoted to the development of chucks and every dollar expended in a Union assures ample returns in service. Correct design and proper materials give Union Chucks the stamina to stand hard usage.



Union Manufacturing Co.

26 Cortlandt St., N. Y.
New Britain, Conn., U. S. A.
Makers of a Complete Line of Chucks

Our Catalog shows full line. Send for your copy.

IF IT HASN'T THIS MARK IT ISN'T A MASTER MARKER

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Police, Special Officer, Watchman, Identification

In addition to almost every conceivable kind and style of Badge, the complete line of *"PANNIER"* Master Markers includes:

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Horton

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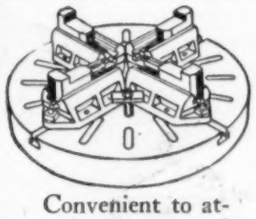

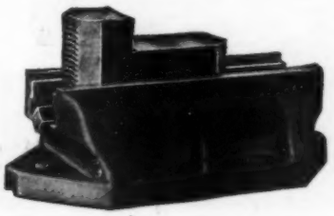

Convenient to attach. Exceptional range. Great strength of body and parts. Either iron or steel body.

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We build Swaging Machines in capacities from ¼ to 4½-in. *Write for the descriptive matter.*

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RAPID *Slip Drill CHUCK*

Drives Straight and True
Cannot Injure the Collet

American Equipment Company, Detroit

CHUCK WITH AIR

The Lavoie Air Chucks are very simple in construction and are easy to operate. The grip is absolutely certain, as is the release. Made in seven types with six styles of jaws.

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Geared Drill Chucks
Standard Drill Chucks
Independent Lathe Chucks
Geared Scroll Lathe Chucks
Combination Lathe Chucks
Right Angle Transmission
Flexible Steel Tubing
Flexible Arms
Micrometers
Fine Mechanical Tools

Illustrative Descriptive Bulletins Mailed upon Request

T. R. *Almond* Mfg. Co., Ashburnham, Mass.

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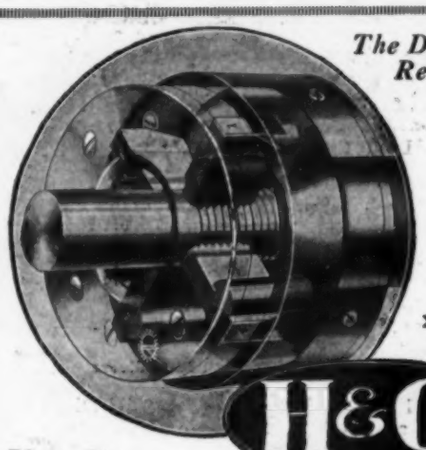

X-ray View

H&G

You Buy

PRODUCTION *and* PRECISION

—not merely a tool—when you buy an H & G Self-Opening Die Head

A die head is only a means to an end—threads.

Thread production and precision have been revolutionized by H & G Self-Opening Die Heads.

These die heads have established

—new standards of Accuracy
—new standards of Pieces per Day.
—new standards of Parts Threaded per Set of Chasers.

The new H & G catalog describes the entire line of H & G Self-Opening Die Heads, Threading Machines and Chaser Grinders.

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THE EASTERN MACHINE SCREW CORPORATION
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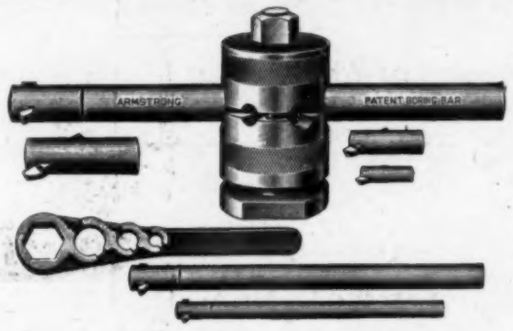
ARMSTRONG
THREE-BAR BORING TOOL



The many points of advantage of this lathe boring tool will be appreciated by practical machinists.

A slight turn of one nut releases or fastens both Bar and Holder.

Bars can be changed as needed almost instantly thus allowing the operator to use the stiffest bar possible for each job, with the result that speeds and feeds can be increased and time saved.

Write for catalog which shows our complete line of tool holders, ratchet drills, drop forged wrenches, lathe dogs, clamps, and other machine shop tools.

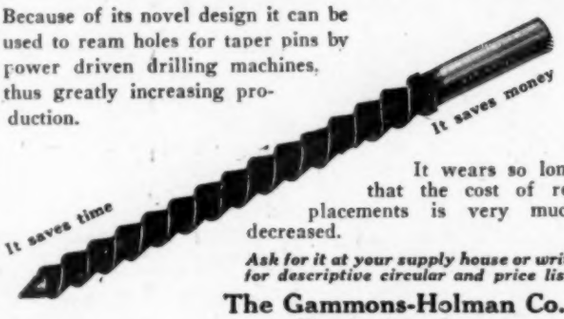
ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
315 N. Francisco Ave., Chicago, U. S. A.

W&B

The Whitman & Barnes Mfg. Co.
TWIST DRILLS & REAMERS
NEW YORK AKRON, OHIO. CHICAGO

The Gammons Taper Pin Reamer

Because of its novel design it can be used to ream holes for taper pins by power driven drilling machines, thus greatly increasing production.



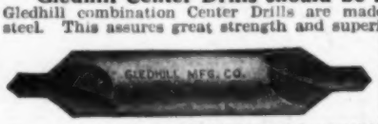
It wears so long that the cost of replacements is very much decreased.

Ask for it at your supply house or write for descriptive circular and price list.

The Gammons-Holman Co.
Manchester, Conn.

Gledhill Center Drills should be in every tool kit

Gledhill combination Center Drills are made from a special alloy steel. This assures great strength and superior cutting qualities.



Expert workmanship enhances accuracy and high speeds are possible without temper drawing. You need this Center Drill in your kit. Get the Circular for sizes and prices.

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FOR
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DURABILITY and ACCURACY
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HIGHEST GRADE FILE MADE. THE FILE YOU WILL EVENTUALLY USE

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Large or small, simple or complicated, any quantity made to order

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often cheaper than castings
—always far superior—

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"The Drop-Forging People"
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Like Using An Auto Without a Brake

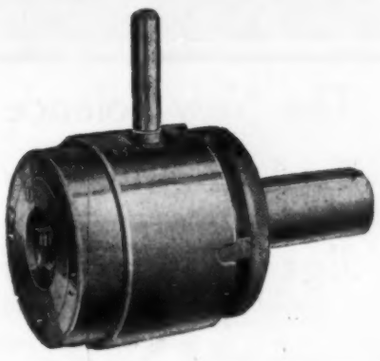
You wouldn't think of driving your car around, with no means of stopping it quickly, would you? Well, when you come to think it out, much the same principle applies in the case of die-heads.

If you use a fixed die-head, you have no positive means of stopping it at the right moment. You cannot guarantee accuracy and you may strip a thread.

If you use a **Victor Self-Opening Die Head** you have an automatic brake in the head itself, because, at exactly the right moment the chasers are released. Threads are finished accurately and there is no danger of stripping since the die-head is not backed out.

You see the point? Well, get the full specifications.

Victor Tool Company
Waynesboro, Pa.



Latrobe
HIGH SPEED DRILLS

Latrobe Drills are Highest Quality in material and workmanship—they are rugged drills—built for speed, accuracy, long life. **Latrobe** Drills are made from hot rolled special section high speed steel [as shown above] hot twisted and the grooves are milled—therefore **Latrobe** drills have all the strength of a forged drill plus the accuracy of a milled drill.
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HIGH LATROBE SPEED

LATROBE TOOL COMPANY
Manufacturers: LATROBE, PA.

LOVEJOY TOOL CO., INC.
SPRINGFIELD, VERMONT, U.S.A.
POSITIVE METAL CUTTING TOOLS LOCKED
INSERTED CUTTER TYPE
TURNING, BORING AND MILLING.

OLIVER OF ADRIAN

Made in seven different types

Die Making Machine
"A Toolmaker in Itself"

Dies, gauges, templets and the like can be sawed, filed, and lapped on this machine. It accomplishes the work, on the average, in from 30 to 60 per cent of the time ordinarily required for handwork. It is useful for experimental work as well as for regular production.

Ask for the "Oliver" Bulletin
Oliver Instrument Company
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AMERICAN

TAPS—DIES—SCREW PLATES—REAMERS
Let us quote on your next order.
American Tap & Die Co., Greenfield, Mass.

CASLER Offset Boring Head

Use it on your milling machine. It is particularly handy on jig and fixture work. Has micrometer adjustment to limits of .001 inch. Write for Catalog "H."

Marvin & Casler Co., Canastota, N. Y.

WVW TOOLS

The WEST Line of Tools

includes milling cutters, end mills, keyway cutters, counterbores, countersinks, two- and four-flute drills and connecting rod tools, and any special tools.

Patents Pending

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TWIST DRILLS, CUTTERS, REAMERS AND SPECIAL TOOLS

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The New Science of Tool Engineering applied to Jigs and Fixtures

Here is the first of a series of three volumes completely covering the new science of **tool engineering.**

This first book deals with the design of jigs and fixtures based on the principles of tool engineering.

It takes up principles and their application to design, shows the reasons why certain methods are better than others, and gives many graphic examples which illustrate the use of the principles involved.

Published February, 1922

Tool Engineering— Jigs and Fixtures

By Albert A. Dowd, President, Dowd Engineering Co.
and
Frank W. Curtis, Chief Engineer, Dowd Engineering Co.

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The man whose knowledge of tools is firmly grounded on sound mechanical principles is bound to be independent, original and progressive, and his designs, practical, economical and productive. This book, therefore, concentrates on and gives the reader a thorough knowledge of the underlying principles of jig and fixture design.

The book will be found useful because:

1. **The reasons why one design is better than another are clearly shown in numerous examples.**
2. **The authors have chosen these examples from actual cases observed during their long experience in handling production problems, both in the shop and the drafting room.**
3. **Actual problems are analyzed.**
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¶ "We wanted to place an important contract in a hurry," they wrote.

¶ "We wanted a firm who could tool up quickly, and then could follow through consistently. We wrote to five firms advertising in the

Contract Work
Section of the
AMERICAN MACHINIST

¶ "We made connections without difficulty, and we got quick action."

¶ And that's the way progressive firms will get together in 1923—through the Great Clearing House of American Specialty shops and plants with Surplus Facilities.

P.S. Are you making use of it?

The Everlasting Chair

That is what our all-metal chairs **really** are. They have pressed steel seats and backs, formed angle iron legs, heavy Bessemer rungs, and are put together with quarter-inch rivets.

They are light in weight, are finished in baked enamel, black or green, and cost but little more than wooden goods. Furnished with or without backs, 3 or 4 legs, 12- or 14-in. seats, and any height. Also with perforated wood seats as shown here.

Leading concerns throughout the world have adopted them as standard.

Write for catalog of our complete lines of metal shop and factory equipment.

Makers of Wash Bowls, Drinking Fountains, Lockers, Shelving, Tote Boxes, Work Benches, etc.

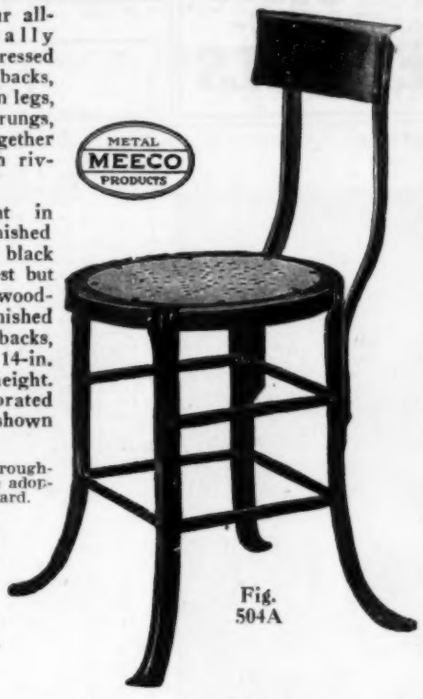

Fig. 504A

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Factory and General Offices:
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BOSTON NEW YORK

The Standard
Since 1864

MORSE
Twist Drill & Mach. Co.
New Bedford, Mass., U. S. A.

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Files of Precision

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Start the new year RIGHT.
Order a trial box.

AMERICAN SWISS FILE & TOOL CO.
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ReMANUFACTURED -(ORIGINATED BY US)- MACHINE TOOLS

REG. U. S. PAT. OFFICE

THIS is a part of a consignment of Libbey Turret Lathes which we have recently purchased from the Government. Some of them have never been set up. They are all to be ReManufactured, and offered to you at a fraction of their real value. We have hundreds of other bargains like these.

The Green List*

of Guaranteed ReManufactured Machine Tools

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50—No. 6 Whitney.
59—Garragus.
3—No. 2 Pratt & Whitney.
22—No. 1 Van Norman.
61—No. 3½ Fox.
225—P. & W., Hendey, Becker, and Garvin, Lincoln Millers.
1—No. 13-B Browne & Sharpe.
1—No. 33 Kempsmith.
2—12-in. P. & W., Semi Aut.
7—Putnam, Semi Aut.
5—Briggs.
4—4-in. Pratt & Whitney Spline.
3—Pratt & Whitney Cam.
1—Beaman & Smith Open Back.
1—48-in.x10-ft. Newton, Duplex.
8—24-in. x 24-in. x 12-ft. Ingersoll Slab.
1—3-spdl. Beaman & Smith Slab.
1—No. 1 Brown & Sharpe, Vert.
3—No. 1½ Milwaukee, Vert.
2—No. 4-B Becker, Vert.
1—No. 3 Becker, Vert.
2—No. 2½ Milwaukee, Vert.
1—No. 3 Brown & Sharpe, Vert.
1—No. 3 Cincinnati, Vert.
1—No. 5 Becker, Vert.
1—No. AB Becker, Vert.
1—No. 5-B Becker, Vert.
8—No. 5-C Becker, Vert.
1—Style B Becker, Vert.
2—No. 6 Becker, Vert.

TURRET AND SCREW MACHINES

3—2-in. x 26-in. Pratt & Whitney.
2—2½-in.x26-in. P. & W., Gd. Hd.
3—3-in. x 36-in. Jones & Lamson.
2—3¼-in. x 36-in. Cincinn. Acme.
1—2-spdl. Jones & Lamson.
10—6-A Model 2 Potter & Johnston.
3—No. 8 Warner & Swasey.
2—No. 3-A Warner & Swasey.
2—21-in. Gisholt.
10—24-in. Gisholt.
26—24-in. Davis.
34—24-in. Steinle.
8—18-in. Libby.
18—26-in. Libby.

GRINDERS

2—No. 1 Morse.
1—No. 11 Ott.
2—No. 2 Fraser, Univ.
6—6-in. x 32-in. Norton.
1—No. 1 Bath, Univ.
1—6-in. x 20-in. Fitchburg.
1—10-in. x 36-in. Thompson, Univ.
12—10-in. x 36-in. Norton.
1—10-in. x 50-in. Norton.
3—10-in. x 72-in. Norton.
1—No. 2 Brown & Sharpe, Univ.
2—12-in. x 36-in. Fitchburg.
3—12-in. x 36-in. Modern.
5—12-in. x 36-in. Landis.
2—No. 3 Landis, Univ.
1—12-in. x 96-in. Landis.
1—12-in. 120-in. Landis.
1—14-in. x 36-in. Norton.
1—14-in. x 48-in. Queen City.
13—14-in. x 50-in. Norton.
5—14-in. x 72-in. Norton.
1—16-in. x 72-in. Norton.
1—20-in. x 96-in. Landis.
1—20-in. x 168-in. Landis.

RADIALS

3—3-ft. American, Sens.
4—4-ft. Carlton, Sens.
1—2-ft. American.
1—3-ft. Western.
1—3½-ft. Western.
1—4-ft. Western.
1—5-ft. Western.
1—6-ft. Western.

PRESSES

1—No. 15 Niagara Horn.
1—30-ton Lucas Forcing.
1—No. 61 V. & O. Str. Side.
6—No. 61 Stoll, Gd.
17—No. 56 Toledo, Gd.
1—No. 57 Toledo.
2—No. D. G. G. 56 Ferracute, Gd.
3—No. 58 Toledo.
1—No. 58 Toledo, Geared.
3—No. 87 Bliss, Gd.
1—No. 76½ Bliss, Gd.
1—No. 59 Toledo, Gd.

AUTOMATIC SCREW MACHINES

1—No. 00 Brown & Sharpe.
1—No. 2 Brown & Sharpe, Semi.
1—No. 2 Brown & Sharpe.
4—No. 75 National Acme.
3—2¾-in. Cleveland.
1—2-in. x 9-in. New Britain.

HORIZONTAL BORING MACHINES

3—Foote-Burt.
1—4-in. Niles.
1—4-in. Newark.
3—No. 1 Detrich & Harvey.
1—Beaman & Smith.
1—2-spdl Espen-Lucas.
1—No. 1, 3¾-in. Bar Barrett.
1—Rochester Floor Borer.
1—No. 3 Beaman & Smith.

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12—24-in. Bullard, New Era.
1—30-in. Gisholt.
1—34-in.-44-in. Colburn.
1—48-in. Colburn.
1—60-in. Bullard.
2—72-in. Cincinnati.

SHAPERS

1—14-in. Worcester.
1—15-in. Potter & Johnston.
1—16-in. Queen City.
1—16-in. Streine.
5—16-in. Walcott.
2—16-in. Steptoe.
1—16-in. Ohio.
2—20-in. Steptoe.
2—24-in. Walcott.
4—26-in. N. B. P.

**This is only a small part of The Green List.*
If the tools you want are not listed here, write and ask us.

HILL, CLARKE & CO OF CHICAGO

649 Washington Boulevard

LATHES

1—20-in. x 10-ft. Lodge & Shipley.
1—20-in. x 12-ft. Walcott.
3—20-in. x 12-ft. American.
3—20-in. x 16-in. American.
1—20-in. x 18-ft. Lodge & Shipley.
26—21-in. x 10-ft. Le Blond.
1—22-in. x 8-ft. L. & S., Gd.
1—22-in. x 10-ft. Lodge & Shipley.
2—24-in. x 10-ft. American.
1—24-in. x 10-ft. Amer., Gd. Hd.
1—24-in. x 10-ft. Hendey, Gd. Hd.
12—24-in. x 12-ft. Providence.
26—25-in. x 10-ft. Sidney.
8—25-in. x 10-ft. Le Blond.
17—25-in. x 12-ft. Le Blond.
4—26-in. x 10-ft. Walcott.
15—26-in. x 10-ft. Whitcomb-Blaisdell.
24—26-in. x 10-ft. Canada.
16—26-in. x 11-ft. Cisco.
13—26-in. x 11-ft. Wickes.
4—26-in. x 13-ft. Wickes.
1—26-in. x 12-ft. Walcott.
27—26-in. x 10-ft. Niles-Bement-Pond.
44—26-in. x 8-ft. Bridgeford.
175—26-in. x 10-ft. Bridgeford.
87—26-in. x 9-ft. Bridgeford.
19—26-in. x 12-ft. Bridgeford.
2—26-in. x 14-ft. Niles-Bement-Pond.
3—26-in. x 14-ft. Bridgeford.
6—26-in. x 16-ft. Bridgeford.
8—26-in. x 20-ft. Bridgeford.
4—30-in. x 11-ft. Amer. Gd. Hd.
4—30-in. x 11-ft. American.
2—30-in. x 11-ft. H. S. & G.
1—30-in. x 20-ft. Amer. Gd. Hd.
18—32-in. x 12-ft. Fitchburg.
1—32-in. x 12-ft. Wickes.
1—36-in. x 12-ft. Wickes.
3—36-in. x 14-ft. Johnson, Gd. Hd.
1—36-in. x 19-ft. Johnson, Gd. Hd.
1—36-in. x 20-ft. Putnam.
13—36-in.x30-ft. Pitts'bgh, Gd. Hd.
4—36-in. x 37-ft. N. B. P., Gd. Hd.
2—36-in. x 42-ft. LeBlond, Gd. Hd.
5—40-in. x 12-ft. Fifield.
2—45-in. x 24-ft. Pond, Gd.

PLANERS

1—24-in.x24-in.x24-in. Cincinnati. Crank.
1—24-in.x24-in.x12-ft. Whitcomb.
3—36-in.x36-in.x18-ft. Cincinnati, 2 hds.
1—42-in.x42-in.x9-ft. N.B.P.
1—48-in.x48-in.x12-ft. Cincinnati.
1—48-in.x48-in.x15-ft. Rockford.
1—48-in.x60-in.x10-ft. Gray.
1—96-in.x72-in.x20-ft. Bement, Miles.

DRILLS

15—14-in. Myers.
1—20-in. Excelsior, B. G.
4—22-in. W. F. & J. Barnes.
2—22½-in. W. F. & J. Barnes.
5—25-in. W. F. & J. Barnes.
2—25-in. Silver.
1—25-in. Barnes.
1—26-in. Barnes.
1—30-in. Barnes.
1—34-in. Barnes.
1—42-in. Cincinnati.
3—No. 1 Baker.
1—No. 310 Baker.
1—No. 315 Baker.
1—No. 513 Baker.
1—25-in., 2 spdl. Rockford.
1—3-spdl. Sigourney.
2—3-spdl. Taylor & Fenn.
3—4-spdl. Allen.
15—6-spdl. Allen.
1—No. 6-B Henry & Wright.
2—No. 11 Natco.
1—No. 11 Pratt & Whitney.
3—No. M-4 Natco.
2—No. 30 Natco.
1—No. 41 Natco.
3—No. 1 Barnes, Horiz.
1—Garvin Two Way Boring Mach.

MISCELLANEOUS

1—1500-lb. Erie Steam Hammer.
1—Cleveland Relieving Mach.
1—3½-in. Landis Sgle. Hd. Bolt Cutter.
3—No. 3 La Pointe Broaches.
1—No. 3 J. N. La Pointe Broach.
2—No. 4 La Pointe Broach.
1—Brown & Sharpe Polishing & Finishing Machine.
1—No. 0 Mitts & Merrill Keyseater.
70—Newton, Betts, Pratt & Whitney, and Garvin Profilers.
1—4-in. Whiton Centering Mach.
1—Whiton Center. Mach. (7 in.)
18—Pilton Slotters.
1—Richert & Shaefer Tapper.
1—Oliver Filing Machine.
1—3-in. Hurlbut & Rogers Cut Off.
1—No. 4-B Dreis & Krump Hand Brake.

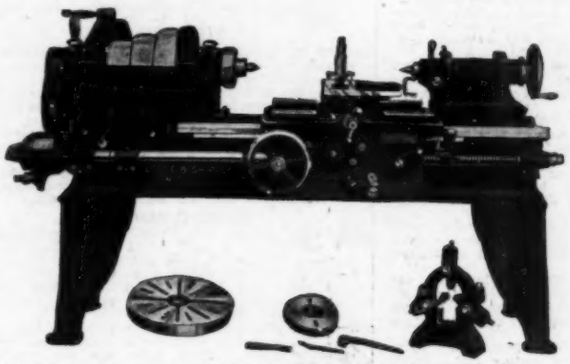
FOR SALE! Complete Equipment

Exceptional opportunity to purchase—Modern Machine Tools, Raw Materials, Supplies, etc.

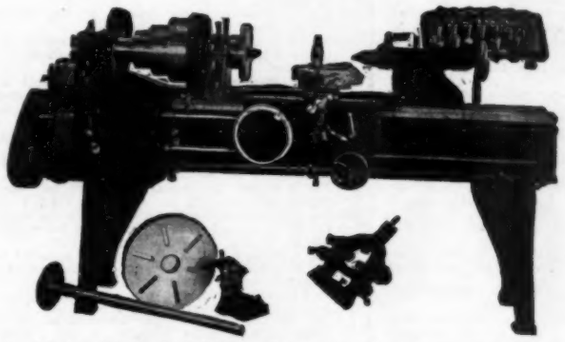
Becker Milling Machine Co., 110 Business St., Hyde Park, Boston, Mass.
Tel. Hyde Park 800

Whitcomb-Blaisdell Mch. Tool Co., 677 Cambridge St., or 134 Gold St., Worcester, Mass.
Tel. Park 4940

Business and Goodwill purchased by REED-PRENTICE CO., Worcester, Mass.



3—18 in. Lodge & Shipley Engine Lathes, Compound Rest, Double Back Gears, Quick Change; similar to cut.



2—16 in. Pratt & Whitney Engine Lathes, Compound Rest, Quick Change, Chuck, Taper Attachment. One machine with collet attachment and 6 collets; similar to cut.

84 Engine Lathes, Cone and Geared Head

Lodge & Shipley, Hendey, Pratt & Whitney, LeBlond, Reed-Prentice, Whitcomb-Blaisdell, Flather, Champion, Boys & Emmes.

16 Turret Lathes

Potter & Johnston, Gridley, Pratt & Whitney, Gisholt.

6 Automatic Screw Machines

Cleveland, Gridley, Pratt & Whitney.

22 Planers

22 in., 24 in., 26 in., 30 in., 36 in., 42 in.

Whitcomb-Blaisdell, Pond, Woodward & Powell, Cincinnati, Gray, Fitchburg.
Also one 60 in. x 60 in. x 14 ft. Gray, late type, two rail heads, two side heads, worm drive.

40 Millers, Plain, Universal, Vertical

Kempsmith, Milwaukee, Becker, Van Norman. Also Becker Planer Type and Duplex.

26 Drills Upright and Multiple Spindle

Sigourney, Snyder, Prentice, Henry & Wright, Blaisdell.

19 Grinders, Plain Cylindrical and Universal

Brown & Sharpe, Landis, Norton.
Also surface, cutter, tool, internal and bench grinders.

12 Gear Cutters

Brown & Sharpe, Gould & Eberhardt, Fellows, Winton, Schuchardt & Schutte.

8 Boring Machines, Horizontal and Vertical

Universal, Niles, Lucas, Beaman & Smith, King, Colburn.

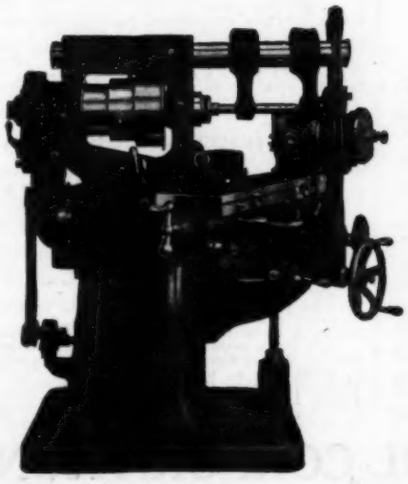
Miscellaneous Machine Tools

Arbor Presses, Shapers, Metal Saws, Centering Machines, Punches and Shears, also woodworking equipment.

Raw Material and Supplies

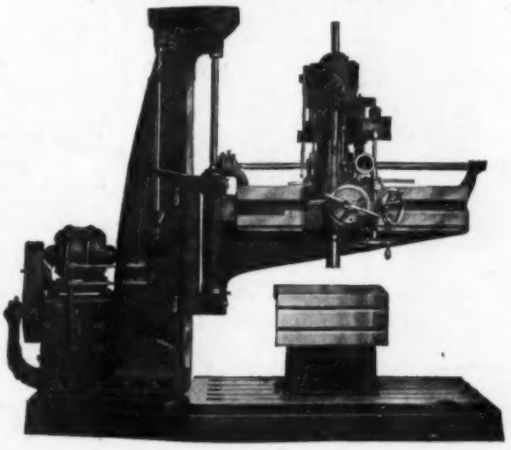
Co'd Rolled, Machinery, High Speed and Tool Steel. Twist Drills, Emery Wheels, Belting, etc.

Cutters of all Descriptions



1—No. 2 Becker Universal Milling Machine, with 12 in. Dividing Head, Tailstock, Pumps, all power feeds, range 28 in. x 14 in. x 18 in., working surface of table 43 in. x 10 in., arranged for motor drive. (Reliance 110 volt D. C. 1½ h.p., 300-1600 r. p. m. motor). Similar to cut.

1—4 ft. Reed-Prentice Radial Drill, ball bearing type, box table 22 in. x 20 in. x 20 in., arranged for motor drive. Similar to cut.



Land and buildings of Becker Milling Machine Co. and Whitcomb-Blaisdell Machine Tool Co. for sale. Detailed description of buildings, plans and prices sent on request. Apply Treasurer at 677 Cambridge St., Worcester, Mass., or Tel. Park 4940.

NEW AND SLIGHTLY USED MACHINE TOOLS

DRILLS

1—No. 3 (used) two spindle Detroit High Speed Ball Bearing drill, plain table in first class condition.
3—14 in. U. S. floor type, wheel and lever feed, square and round tables, cup and crotch centers, countershaft.
2—21 in. Cleveland stationary head, wheel and lever feed only, back gears, round table, square base, tight and loose pulley drive.
2—22½ in. Cleveland upright stationary head, back gears, power feed, automatic stop, round table, square base, tight and loose pulley drive.
2—23½ in. Cleveland stationary head, back gears, power feed, round table, square base, tight and loose pulley drive.
7—26 in. Cleveland upright, stationary head, back gears, geared power feed, automatic stop, round table, square base, tight and loose pulley drive, with tapper.
2—28 in. Kern, sliding head, back gears, power feed, automatic stop, round table, square base, tight and loose pulley drive.
2—32 in. Kern, sliding head, back gears, power feed, automatic stop, round table, square base, tight and loose pulley drive.
1—REED BROS. (Barr), 4 spindle, Style B, plain bearing, sensitive type, 14 in. swing, hand lever feed, regular equipment.

PRESSES

2—No. 10 Lebanon foot presses.
3—No. 0 Arbor presses.
4—No. 1½ Arbor presses, bench type.
10—No. 2 Arbor presses.
4—No. 3 Arbor presses.
1—No. 3-A Arbor press.
2—No. 4 Arbor presses.
1—No. 5 Arbor press.
1—No. 28 Arbor press, floor type.
1—Thirty ton Perfection Arbor press, (used).

POWER PUNCH PRESSES

1—No. 5½ (used) Bliss Consolidated open back inclinable flywheel type, wrenches, bolster plate.
2—No. 3 Loshbaugh-Jordan open back, inclinable flywheel type.
No. 4 Loshbaugh-Jordan open back inclinable flywheel type.
1—No. 5-A Williard open back inclinable flywheel type.
1—Lourie Hydraulic press, 40 tons cap. (used).

GRINDERS

3—Drill grinders, capacity ⅛ in.-1½ in., floor type, single holder, dry, with countershaft.
1—Drill grinder, capacity ¼ in.-2½ in., floor type, single holder, dry.
2—Drill grinders, capacity ¼ in.-2½ in., floor type, single holder, wet.
1—Drill grinder, complete with drill grinding attachment on one end and thinning wheel on the other, countershaft and all regular equipment, capacity ¼ in.-2½ in.
4—No. 2 Reid Bros. surface grinders, feeds: Longitudinal feed automatic, 18 in.; Cross automatic, 6 in.; Vertical feed 11½ in., with countershaft and equipment.
3—No. 1 Wilmarth & Morman surface grinders, Longitudinal feed, 15 in., cross feed, 7 in., vertical table movement, 10 in. (all hand).
1—No. 1 Norton cutter and reamer grinder, complete including single speed countershaft, swivel head stock, 5 wheels, but no regular attachments.
1—No. 2 Norton Universal Cutter and Reamer grinder, complete with all regular attachments including countershafts and wrenches.
1—No. 1 Wilmarth & Morman Universal Cutter and Reamer Grinder, complete with all regular attachments equipped with power feed, countershafts and wrenches.
1—No. 2¼ Webster & Perks, plain bearing, floor type grinder with Hyatt roller bearing C.S. Size of wheel, 30 in. x 4 in.
1—No. 1¼ Webster & Perks, plain bearing, floor type grinder with Hyatt roller bearing C.S.
1—No. ⅝ Webster & Perks, plain bearing, floor type, square pedestal with countershaft and 12 in. plain wheel guard. Size of wheel, 8 in. x 1 in.
1—No. 1 Webster & Perks, electric grinder, floor type, with 1 hp., 220 v., 3 ph., 60 cy. motor and plain wheel guards. Size of wheel, 10 in. x 1½ in.
1—8 x 18, 1—8 x 30 and 1—12 x 36 (slightly used) Modern Plain Cylindrical Grinders, with Factory Guarantee Complete with all equipment
1—No. 3 (13 in. x 40 in.) Slightly used Modern Universal Cylindrical Grinder with Factory Guarantee. Complete with all equipment.
1—No. 2 Used Brown & Sharpe cutter grinder.

LATHES

2—No. 100 Wells speed lathes, 11ft. x 4 ft. with countershafts.
3—Blount 11 in. x 4 ft. speed lathes and countershafts.
1—12 in. x 5 ft. Worcester semi-quick change gear, engine lathe, three step cone pulley, single back gear.
4—14 in. x 6 ft. (Cisco), three step cone, double back geared engine lathe, complete with all regular equipment.
1—(Used) 14 in. x 6 ft. Whitcomb-Blaisdell lathe, three step cone, pulley belt drive double back geared, quick change gears; fair condition.
3—16 in. x 6 ft. (used) Whitcomb-Blaisdell engine lathe with three step cone, double back gear, four sided turret tool post on cross slide, steady rest, countershaft, used machine.
1—16 in. x 10 ft. Cisco engine lathe, three step cone, double back gears, quick change gear, countershaft, wrenches and all regular equipment.
1—18 in. x 8 ft. Cisco engine lathe three step cone, double back geared, quick change gear, steady rest, countershaft, wrenches and all regular equipment.
1—20 in. x 11 ft. Chard engine lathe, quick change gear, double back geared, three step cone, countershaft and all regular equipment.
1—20 in. x 10 ft. Wickes engine lathe, quick change geared, three step cone, double back geared, countershaft, wrenches and all regular equipment.
1—20 in. x 8 ft. (used) Davis engine lathe, actual swing, 22 in.; three step cone for 4 in. belt, double back geared, hollow spindle, machine fitted with pan bed, fair condition, needs some overhauling.
2—21 in. x 10 ft. (used) Le Blond heavy duty, quick change gear, screw cutting engine lathe, three step cone pulley belt drive, double back gears, power cross and longitudinal feed, equipped with taper attachment, compound rest, large and small face plates, center rest, countershaft, chucks, wrenches, etc.
1—24 in. x 13 ft. Chard engine lathe, quick change gear, double back geared, four step cone, complete with countershaft and all regular equipment; actual swing, 26 in., distance between centers, 54 in.; hole through spindle, 2⅛ in.
1—24 in. x 10 ft. Advance engine lathe, three step cone, pulley belt drive, double back gear, quick change gears, complete with all regular equipment, double friction and countershaft.
1—72 in. x 46 ft. Fifield engine lathe, (used) standard triple geared, standard pattern, gear head, complete with two carriages, taper attachments and hollow bored spindle, also 1 50 hp., 220 v., d.c. G. E. motor, frame BA with T-94 drum controller and CR 3221 Resister.
1—16 in. (used) Dreses, plain turret lathe, friction geared head with countershaft, no cut-off slide.
1—(Used) Meriden Turret Lathe, plain head, with countershaft, no cut-off slide.
1—No. 11 (used) Garvin screw machine with collets, ⅛ in., ¼ in., and ⅞ in., complete with wire feed, cut-off slide, countershaft, and all regular equipment; in first class condition.
1—20 in. (used) Steinle turret lathe, actual swing, 22 in.; fitted with three jaw Universal chuck, spindle has 4⅛ in. hole.. Machine is in first class working condition.

SAWS

1—(Used) Lee Simple Cold Saw No. 15. Capacity 5½ in. round stock, 5 in. square stock, 9 in. I beam or flat, single pulley drive machine; no countershaft.
1—6 x 6 Starrett Hack Saw with floor pan and attachment.

BAND SAWS

7—Napier 10 in. x 10 ft. Horizontal Metal cutting machines, arranged belt drive.

MILLING MACHINES

2—No. 2 Cleveland Plain Milling machine, single pulley drive, complete with 1¼ in. arbor, machine fitted with No. 11 B & S taper.
3—No. 1-A Fox plain millers, back geared, auto. long. feed, hand cross vert. feed, cone drive, countershaft, and all regular equipment.
2—No. 2B Fox plain milling machines, complete with countershafts and all regular equipment. Power longitudinal feed. Surface 8½ in. x 24 in.
2—O-B Fox plain millers, long. feed (power) 17¼ in.; cross feed (hand) 3½ in.; vert. feed (hand) 5⅜ in.; cone drive, double feed with countershaft and all regular equipment.

MILLING MACHINES (continued)

1—(Used) No. 2 Beaman & Smith Horiz. Spindle drilling, boring and milling machine, motor driven with 1 Reliance variable speed d.c., 6 hp., motor for driving spindle and 1 variable speed d.c., 2 hp. motor for feed and operating head up and down the column back and forth with E. C. and M. control.
1—No. 4 LeBlond Plain Heavy Duty Milling Machine, Power Feeds in all directions. Oil pump and connections. Equipped with 10 hp. variable speed, d.c. Jantz & Leist motor, 500 to 1500 r.p.m.
1—No 4 LeBlonde Milling Machine, power feeds in all directions. Variable speed, 6 hp., d.c. motor drive

SHAPERS

3—16 in. Milwaukee back geared, crank shapers, with swivel tables, swivel vises, cone drive, countershafts and all regular equipment.
1—16 in. Bertschy Mattison back geared crank shapers, complete with vises, countershafts and all regular equipment.
2—20 in. Milwaukee back geared crank shapers, with swivel tables, swivel vises, cone drive, countershafts and all regular equipment.
2—24 in. Milwaukee back geared crank shapers, with swivel tables, swivel vises, cone drive, countershafts and all regular equipment.

BORING MILLS

2—48 in. Colburn Std. Pattern with 2 swivel or 1 swivel and 1 fixed turret head. Belt and motor drive, plain table and all regular equipt.
1—54 in. Colburn Std. Pattern with 2 swivel or 1 swivel and 1 fixed turret head. Belt and motor drive. Plain table and all regular equipment.
2—72 in. Colburn Std. Pattern with 2 swivel or 1 swivel and 1 fixed turret head. Belt and motor drive. Plain table and all regular equipment.

PLATE SHOP TOOLS.

1—No. 2 Hilles & Jones single punch, 36 in. throat depth, capacity 1 in. thru ⅞ in. or to shear ¾ in. plate.
1—No. 3 (used) single punch, 25 in. throat depth, capacity 1¼ in. in 1 in.
1—No. 4 Single punch, 48 in. throat depth, capacity 1½ in. thru 1 in. or will shear 1⅛ in. plate.
1—No. 5 Double end punch or coper, (used) 20 in. throat depth one end and 22 in. other end. Capacity 2 1 in. holes in 1 in. and for 24 in. standard sections.
2—No. 2 Horizontal punch, 12 in. throat depth, capacity 1 in. thru 1 in.
1—No. 2 Horizontal punch, 12 in. throat depth, capacity, 1 in. diameter, thru 1 in. (used).
1—No. 3 (used) Horizontal punch, 12 in. throat depth, capacity 1¼ in. diameter, thru 1 in.
1—No. 3 Guillotine frame bar shear, 16 in. blades for flat or square bars, capacity 2½ in. square, 10 in. x 1¼ in. flats, 2 in. rounds.
1—No. 4 Double Guillotine Bar Shear mounted on 10 ft. blades for flat or square bars, capacity designed for 4 in. square hot bars, 3½ in. cold square, 12 in. x 1½ in. flats, 4 in. round.
1—No. 2 Rotary Bevel shears, cap. ¾ in. plate.
1—No. 4 Double angle shear mounted on 10 ft. diameter turn table, capacity, 8 in. x 8 in. x 1 ft. angles. (Used).
1—No. 3 Gate shear (used). Distance between housings 134 in., throat depth of housings, 31 in., ¼ in. plate.
1—No. 6½ Gate shear (Used). 66 in. between housings, 36 in. throat depth, capacity, 60 in. of 1 in. plate.
1—No. 4 Plate straightening rolls, distance between housings, 128 in. 6 14 in. rolls.
1—No. 4 Plate straightening rolls, distance between housings, 86 in. 6 14 in. rolls. Capacity 84 in. of 1 in. plate.
1—"A" roller leveller. Distance between housings, 42 in. or 48 in. if preferred. 18 2¾ in. dia. rollers. Capacity No. 18 and No. 20 sheets cold.

MISCELLANEOUS

1—(Used) 2000 lb. Bennington scale.
1—⅜ in. Rickert & Shafer horizontal bench tapping machine, complete as regularly furnished.
1—No. 2 Mitts & Merrill little giant keyseating machine complete with all standard equipment, including countershaft, 1¼ in. arbor and set of cutters.
1—No. 732 Greenfield bolt threading machine, capacity ¼ to ½, ⅝ to 1 in. dies (Pipe), for the above, complete with countershaft, all regular equipment.
1—6 in. Wallace Bench wood jointer, 110 v., a.c., single phase motor.
1—No. 3 Barry Die Filing machine, floor type, belt driven, countershaft right on the machine.
1—4 in. Wallace Bench wood jointer, complete with motor, 110 v., direct current.
1—No. 18 Lennox throatless shear.
1—No. 1 Robinson Bench Filing machine.

CONSOLIDATED MACHINE TOOL CORPORATION of AMERICA

Plants:
Betts Machine Plant, Rochester, N. Y. (Phone: Chase 4600)
Modern Tool Plant, Erie, Pa. (Phone: Bell 2150)
Hilles & Jones Plant, Wilmington, Del. (Phone: Wil. 4230)
Newton Mach. Tool Plant, Phila., Pa. (Phone: Locust 0125
Colburn Mch. Tool Plant, Cleveland, O. (Phone: Eddy 4082)

GENERAL OFFICE:
17 E. 42nd St., New York
(Phone Vanderbilt 3930)

District Offices:
Pittsburgh, 1915 Oliver Bldg. (Phone: Grant 424)
Philadelphia, 23rd and Vine Sts. (Pohne Locust 0125)
St. Louis, 1956 No. Broadway (Phone: Tyler 747)
Chicago, Ill., 541 W. Washington Blvd. (Franklin 1242)
Cleveland, O., 1038 Ivanhoe Road (Eddy 4082)

SECOND-HAND MACHINE TOOLS

DRILLS

1-spindle Avey ball bearing.
3-spindle Henry & Wright ball bearing.
3-spindle Taylor & Fenn.
4-spindle Francis Reed.
20-in. Prentice Br. slid. hd. B.C., P.F.
28-in. Snyder, sl. hd., B.C., P.F.
32-in. Superior, sl. hd., B.G., P.F.
42-in. Cincinnati-Bickford sl. hd., B.G., tap. att.
No. 17 4-spdl. Foote-Burt gang drill.
No. 30 Bausch multiple spindle.
3-ft. Cincinnati-Bickford plain radial, tap. att.
3-ft. No. 0 Bickford plain radial, tapping att.
3-ft. Mueller plain radial, tapping att.
3-ft. American plain radial.
5-ft. Dreses plain radial, tapping.

LATHES

9-in. x 20-in. Porter Cable mfg. lathe.
12-in. x 6-ft. Hendey Lathe, C.R., P.C.F., Q.C.
14-in. x 6-ft. Hendey Lathe, C.R., P.C.F., Q.C.
14-in. x 6-ft. Monarch C.R., P.C.F., Q. C. G.
14-in. x 8-ft. Lodge & Shipley C.R., P.C.F., Q.C.G.
16-in. x 8-ft. Champion, C.R., P.C.F., Q.C.G.
16-in. x 8-ft. Lodge & Shipley, geared hd., C.R., P.C.F. taper att. Longitudinal and cross feed stops.
17-in. x 8-ft. Flather, C.R., P.C.F., Q.C.G.
18-in. x 8-ft. Greaves-Klusman, C.R., P.C.F., Q.C.G.
18-in. x 8-ft. Whit.-Blaisdell, C.R., P.C.F., Q.C.G.
20-in. x 8-ft. American, C.R., P.C.F
24-in.x14-ft. Greaves-Klusman, C.R., P.C.F., Q.C.
32-in. x 14-ft. Hamilton, C.R., P.C.F., triple geared.
38-in. x 16-ft. Pond, geared head, C.R., P.C.F., triple geared, arr. M.D.

BORING MACHINES

No. 1 Lucas table type, hor. bor. & drilling mach. 3-in. bar.

BORING MACHINES (Cont'd)

No. 2 Beaman & Smith floor type, arr. M.D., 4-in. bar.
34-in. Colburn, turret head, vertical.
38-in. Niles, 2 reg. heads, vertical.
51-in. Niles 2 reg. heads, vertical.

SCREW MACHINES AND TURRET LATHES

⅜-in.-½-in. cap. Cleveland auto. Model A screw machine.
⅝-in.-⅞-in. cap. Cleveland auto. Model A screw machine.
½-in. cap. Cleveland pl. auto. Model B screw machine.
1-in. cap. Cinti.-Acme wire feed screw machine.
1¼-in. cap. Cinti.-Acme wire feed screw mach.
1½-in. cap. Cinti.-Acme wire feed screw mach.
2½-in. cap. Cinti-Acme wire feed screw mach.
16- and 18-in. Cinti.-Acme univ. Fox turret lathe.
2¼-in. x 24-in. Jones & Lamson, bar or chucking turret lathe.
3¼-in. x 36-in. Jones & Lamson, bar or chucking turret lathe.
No. 1-B Foster geared head turret lathe.

MILLERS

No. 2, 3 and 4 Cincinnati plain.
No. 5 Cincinnati plain hp.
No. 2B Brown & Sharpe plain.
No. 2, 5 and 9 Kempsmth plain.
No. 3 and 4 Cincinnati vertical.
No. 2A, C-2, 4B and 5 Becker vertical.
No. B2 Becker continuous type vertical.
No. 1½, 2 and 3S Cincinnati universal.
No. 1½ Brown & Sharpe universal.
36-in. x 10-ft. Newton, face slab type.
4½-in. x 12-in. Pratt & Whitney thread milling machines.

GRINDERS

3-in. x 18-in. Norton plain.
6-in. x 32-in. Norton plain.
10-in. x 36-in. Norton plain.

GRINDERS (Cont'd)

10-in. x 30-in. Landis plain.
12-in. x 120-in. Landis plain.
16-in. x 52-in. Landis plain crankshaft grinder.
12-in. x 40-in. B&S universal.
12-in. x 36-in. Cincinnati universal.
2-12-in. x 24-in. Diamond surface.
Taylor high-speed water tool grinder.
No. 1 Cincinnati cutter and reamer grinder.
No. 60 Heald cylinder grinder.
No 11 Rivett Ball Race, with power oscillating att.
Saxon face grinder.
10-in. Garrigus rotary, with magnetic chuck.
No. 2 Brown & Sharpe surface grinder.
18-in. and 20-in. disc grinders.

SHAPERS AND PLANERS

14-in. Gould & Eberhardt crank shaper, B.G.
20-in. Davis crank shaper, back geared.
24-in. Stockbridge crank shaper, back geared.
15-in. and 24-in. Hendey friction shapers.
24-in. x 24-in. x 6 ft. Flather planer, 1 hd.
36-in. x36-in. x 12-ft. Pond planer, 2 hds.
48-in. x 48-in. x 15-ft. Sellers planer, 3 hds.
60-in. x 40-in. x 12-ft. Pond planer, 2 hds.
66-in. x 60-in. x 30-ft. Bement planer, 3 hds.
96-in. x 60-in. x 12-ft. Detrick & Harvey open-side convertible planer, 4 hds., M.D.

MISCELLANEOUS

No. 3 Lapointe broaching machine.
No. 72 Ferracute press.
No. 13 P & W profilers.
36-in. Gould & Eberhardt gear cutter.
36-in. B & S gear cutter.
18-H Gould & Eberhardt hobbing gear cutter.
¾-in. x ¾-in. single end punch and shear.
6-in. Gleason bevel gear generator.
American and Stewart furnaces.
Newton, Burr and Racine Saws.
Bliss & Adriance power presses.
30-Ton Lucas Forcing Press.

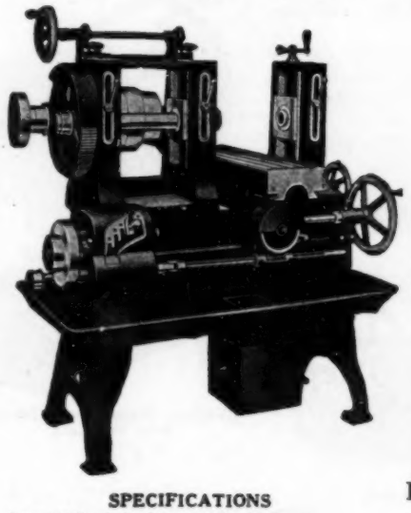
THIS IS BUT A PARTIAL LIST OF OUR STOCK

HENRY PRENTISS & COMPANY,
149 BROADWAY, NEW YORK, N. Y.

BOSTON BUFFALO HARTFORD SYRACUSE ROCHESTER

---

100 Hendey No. 4
Lincoln Type Millers



SPECIFICATIONS

Longitudinal feed (power), 20 in.
Cross feed, 5 in.
Vertical adjustment of spindle, 8 in.
Size of table 24 in. x 6 in. (2—⅝ in. T slots).
Greatest distance between spindle and table 9 in.
Number of feed changes, 12
Taper hole in spindle, B. & S. No. 10
Speed of countershaft, 200 r.p.m.
Weight, about 2,200 pounds.

LOOK
Some Bargain

Your choice of either a

Hendey or Becker
Lincoln Type Miller

$125.00 Each
F.O.B. cars Newark, N. J.

Each machine nearly new and guaranteed in A-1 condition and complete with countershaft and oil pump but no arbor.

Terms 1/3 with Order. Balance Sight Draft against Bill of Lading

200 Becker No. 7-H
Lincoln Type Millers

SPECIFICATIONS

Longitudinal feed (power), 19½ in.
Cross feed, 7 in.
Vertical adjustment of spindle, 9 in.
Greatest distance between spindle and table, 9½ in.
Size of table 29 in. x 9 in. (3—⅝ in. T slots).
Number of spindle speeds, 3
Taper hole in spindle, B. & S. No. 10
Speed of countershaft, 160 r.p.m.
Weight, about 2,400 pounds

New Jersey Machinery Exchange, 21 Mechanic St., Newark, N. J.

127-131 N. Third St.

FRANK TOOMEY, Inc.

Philadelphia, Penna.

LATHES

1—13-in. x 5-ft. 6-in. Carroll-Jamieson.
2—14-in. x 5-ft. Hendey Q.C.G.
1—14-in. x 6-ft. 8-in. and 10-ft. Carroll-Jamieson, Q.C.G.
1—15-in. x 6-ft. and 8-ft. Sidney Q.C.G., D.B.G.
1—15-in. x 6-ft. Davis Tool Room, Taper & Relieving Attachment.
1—18-in. x 10-ft. Boye & Emmes, Q.C.G., D.B.G.
2—17-in. x 8-ft. and 10-ft. Sidney, Q.C.G., D.B.G.
3—19-in. x 8-ft.-10-ft. and 12-in. Sidney, Q.C.G., D.B.G.
1—25-in. x 12-ft., 14-ft. and 16-ft. Sidney, Q.C.G.-D.B.G.
1—35-in. x 16-ft. and 18-ft. Sidney, Q.C.G., D.B.G.
1—18-in. x 14-ft. Reed Pl. Change Taper Att.
1—16-in. x 6-ft. Economy, Q.C.G., D.B.G.
1—18-in. x 8-ft. Boye & Emmes, Q.C.G., D.B.G. Taper Att.
2—18-in. x 8-ft. Wolcott, Q.C.G., D.B.G.
1—18-in. x 8-ft. Wolcott, Pl. Chg. Taper Att.
5—18-in. x 8-ft. Whitcomb-Blaisdell, Q.C.G., D.B.G.
1—34-in. x 24-in. Putnam Triple Geared, Motor driven, Taper Att., C.R-P.C.F. 2—C.G.-D.B.G. 2-in. Hollow Spindle, 32-in., 4-Jaw Indpt. Chuck fitted.
1—36-in. x 24-ft. Putnam, same as above.
1—64-in. x 38-ft. Putnam, Motor Driven, Triple Geared, Q.C.G., Taper Att., 2½-in. Hollow Spindle, C.R.-P.C.F., complete and equipped with 20-hp., D.C., 220-v. Motor. (Will change motor to suit purchaser.)
1—18-in. x 10-ft. Sidney, Geared Head, Motor Drive, Q.C.G., D.B.G.
1—14-in. x 8-ft. Sidney, Q.C.G., D.B.G.

PLANERS

24-in. x 24-in. x 6-ft. Whitcomb, 1 hd., belt drive.
24-in. x 24-in. x 6-ft. Amer., 1 hd., belt drive.
24-in. x 24-in. x 6-ft. Pease, 1 hd., belt drive.
24-in. x 24-in. x 8-in. Hendey, 1 hd., belt drive.
30-in. x 30-in. x 6-ft. Pease, 1 hd., belt drive.
30-in. x 30-in. x 8-ft. New H. 1 hd., belt drive.
30-in. x 30-in. x 10-ft. Dustin, 1 hd., belt drive.
30-in. x 30-in. x 10-ft. Cleveland, Open Side, 2 hd., motor drive.
36-in. x 36-in. x 10-ft. Cincinnati, 3 hd., motor drive.
36-in. x 36-in. x 14-ft. Ohio Planer head.
44-in. x 44-in. x 12-ft. Cleveland, Open Side, 3 hd., motor drive.
48-in. x 48-in. x 16-ft., 3 hd., belt drive.

SHAPERS

1—14-in. Davis.
1—16-in. Whip.
3—16-in. Steptoe, Belt Drive.
3—16-in. Steptoe, Motor Drive.
1—20-in. Smith & Mill.
3—24-in. Steptoe, Belt Drive.
1—24-in. Steptoe, Motor Drive.

MILLERS

1—No. 0 Steptoe, plain, power feeds.
1—No. 11 Garvin, plain.
1—No. 3½ Fox, plain.
1—No. 1 Bickford, plain.
2—No. 16 Whitney, plain.
1—No. 1 Dow, plain, power feeds.
2—No. 2 Cleveland Universal, high power, single pulley.
1—No. 2 Le Blond, plain, power feeds.
1—No. 2-A Brown & Sharpe, Univ., sgle. pulley.
1—No. 2 Owen Universal, power feed.
1—No. 3 Cincinnati, Universal, power feed.
1—No. 4 Brown & Sharpe, plain, power feeds.
1—No. 4 Cincinnati, plain, high power.
2—No. 2 Brown & Sharpe, Vert., power feeds.
1—No. 22 Garvin, Vertical, power feeds.
1—No. 6 Becker, Vertical, power feeds, late type.
1—No. 2 Garvin, plain power feeds.
2—No. 2 Cleve. Univ., high power, sgle. pulley.

GRINDERS

1—No. 1 Le Blond Universal Tool and Cutter.
1—No. 2½ Walker Surface Grinder with magnetic chuck.
2—Greenfield Tool and Cutter.
1—No. 1 Fraser Universal.
1—No. 3 Brown & Sharpe Cutter and Reamer.
1—10-in. x 36-in. Norton, plain.
1—10-in. x 40-in. Norton, plain.
1—10-in. x 50-in. Norton, plain, with camshaft attachment.
1—14-in. x 96-in. Norton, plain.
Wet Tools and Double End Grinders, all types.
1—No. 60 Heald, all attachs., Serial No. 2113.
1—12-in. x 66-in. (No. 4) Landis, Universal.

DRILLS

4—10-in. Buffalo Sensitive, bench.
6—15-in. Buffalo Sensitive, floor.
6—14-in. Excelsior Sensitive, floor.
10—14-in. U. S. Sensitive, floor.
15—20-in. Champion B.G., P.F.
1—21-in. Aurora, B.G., P.F. Tapping Att.
1—21-in. Superior, B.G., P.F.
1—24-in. Prentice, Sliding Head, B.G., P.F.
1—28-in. Rockford, Sliding Head, B.G., P.F.
1—32-in. Superior, Sliding Head, B.G., P.F.

DRILLS (Cont.)

1—36-in. Superior, Sliding Head, B.G., P.F.
1—Single Spindle Foote-Burke, Heavy Duty.
1—Single Spindle Baker, Heavy Duty.
1—4-Spindle Kokomo, Sensitive.
1—Single Spindle Kokomo Sensitive.
1—6-Spindle Allen Sensitive.
1—4-ft. Bickford, Plain Gear, box drive.
1—5-ft. Niles, Universal, gear box.
5—5-ft. Bausch, Universal, motor drive.
1—7-ft. Fosdick, plain, belt drive.

BORING MILLS

2—42-in. Bausch, Vertical, 2 hds., motor drive.
1—42-in. Bullard, Vertical, 2 hds., belt drive.
2—No. 1 Cleveland, Horiz., 2½-in. bar, sgle. pulley.
1—Universal 3-in. bar.
1—42-in. Pond Wheel, motor driven.

GEAR CUTTERS

1—No. 3 36-in. Brown & Sharpe, Spur.
1—No. 18 Brown & Sharpe, Spur and Bevel.
6—No. 6 Bellows Gear Shapers.

SCREW MACHINES

1—1-in. Smurr & Kamen, wire feed.
1—No. 3 Bardon & Oliver, wire feed.
1—No. 4½ Bardon & Oliver, wire feed.
1—No. 3¼-in. x 36-in. Acme Flat Turret, Bar and Chucking.
1—2¾-in. x 24-in. Jones & Lamson, Bar and Chucking.
1—2-in. Pratt & Whitney, New model, wire feed.
1—21-in. Gisholt.
1—3¼-in. x 40-in. Greenlee.
1—2¼-in. x 7-in. Gridley, 4-spindle.
1—No. 52 National Acme.
1—No. 6 Warner & Swasey.
1—No. 6A Potter & Johnston, Automatic.
1—22-in. x 8 ft. 6-in. Bullard, all power feeds, taper att.

MISCELLANEOUS

1—10-in. to 12-in. Dill Slotter, belt driven.
1—4-in. Whiton Centering Machine.
1—800-lb. Niles-Bement Steam Hammer.
3—25-lb., 50-lb., 100-lb. Little Giant Belt Hammers.
3—2-in., 4-in. and 6-in. Oster Pipe Machines.
1—2-in. Jarecki Pipe Machine.
1—No. 2 Catlin Keyseater.
1—No. 4 Catlin Keyseater.
1—No. 12 Pratt & Whitney Profiler, 2 spindles.
1—10-ft. 3/16-in. Ohl Power Squaring Shear.
Peerless Hacksaws, all sizes, new and used.

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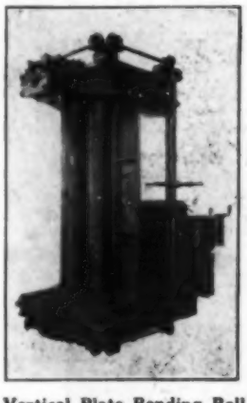

Vertical Plate Bending Roll
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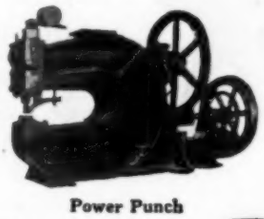
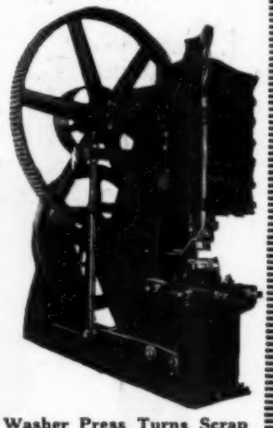
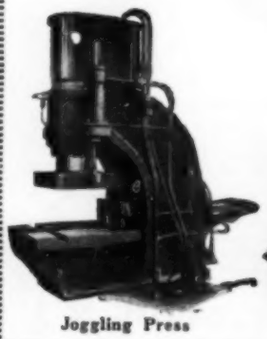


Power Punch



Washer Press Turns Scrap Into Washers



Joggling Press

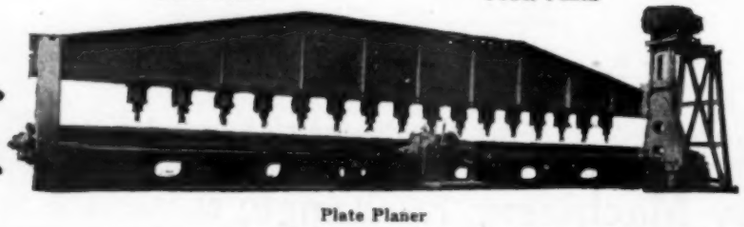


Plate Planer

Gray Rotary Cutting Shears

Look At These!

Every one an UNUSUAL machine to find and all at real BARGAIN prices

BORING MILLS
No. 0 (32) Giddings & Lewis Horizontal.
Lucas Horizontal.
32-in. King Vertical.

DRILLS
28-in. Reed-Prentice, sliding head.
28-in. Barnes, sliding head.
4 Spindle Henry & Wright, 1⅛-in. drills.
12 Spindle Fox drill.

FURNACE
Stewart Combination Furnace.

GRINDERS, cylindrical
No. 1 Brown & Sharpe, universal.
No. 1 and 2 Morse, universal and plain.
No. 103 Rivett, internal.

GRINDERS, Cutter and Tool
No. 2 Oakley.
No. 1 Le Blond.

GRINDERS, Disc
No. 4 Gardner disc.
No. 14 Gardner combination disc.
No. 8 Gardner disc.

DIE SINKERS
No. 2 Pratt & Whitney.
No. 3 Pratt & Whitney.

HAMMERS
40 lb. Bradley cushioned helve. Merrill board hammer.

KEYSEATERS
No. 2 Davis Keyseater.

GEAR CUTTER
No. 6 Fellows gear shaper.

LATHES
Ames bench precision.
Pratt & Whitney precision.
3½ Stark precision.
26-in. x 10-ft. Bridgeford heavy duty.
22-in. x 10-ft. Reed.
16-in. x 8-ft. Pratt & Whitney tool room.
16-in. x 5-ft. Whitcomb tool room.
20-in. x 8-ft. Cisco.
10-in. Pratt & Whitney tool room.
16-in. x 6-ft. Cleveland, New, but cheap.

MILLERS
No. 2 Van Norman Duplex.
No. 2 Rockford heavy duty, universal.
No. 1 Garvin universal.
Type A Briggs.
No. 12 Garvin, plain.
No. 6 Whitney hand.

PLANERS
60-in. x 60-in. x 14-ft. Niles-Bement-Pond Planer, 4 heads, motor driven.
24-in. x 24-in. x 6-ft. Gray, 2 heads.

SCREW MACHINES
No. 00 Brown & Sharpe automatic.
No. 2 Davenport.
⅝-in. Pratt & Whitney hand.
2-in. x 24-in. Jones & Lamson.
⅞-in. Cleveland, Model A automatic.
⅝-in. Cleveland, Model A automatic.
No. 1 and 2 Garvin hand.
No. 10 Foster, geared head.
No. 5A and 6A Potter & Johnston automatics.
No. 3 and 4 Foster hand.

TAPPERS
⅝-in. National Acme nut tapper.
¾-in. Rickert-Shaffer horizontal.
No. 1 Garvin vertical.

WIRE STRAIGHTENER
⅜-in. Shuster Wire Straightener.

SHAPERS
24-in. Cincinnati.
24-in. Gould & Eberhardt.
20-in. American.
20-in. Stockbridge.
20-in. Gould & Eberhardt.
15-in. Hendey Friction.

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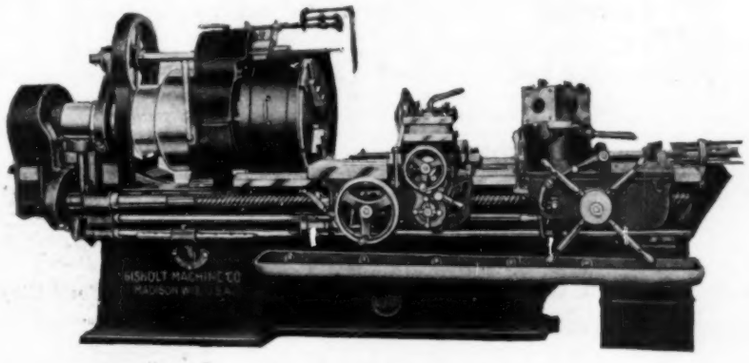

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Gisholt Turret Lathes

Two 21-in.—3½-in. Spindle Bore
Three 24-in.—6¼-in. Spindle Bore

These lathes have been entirely rebuilt in our own shop with same jigs and fixtures used when first built. We guarantee them to be as accurate as new machines.

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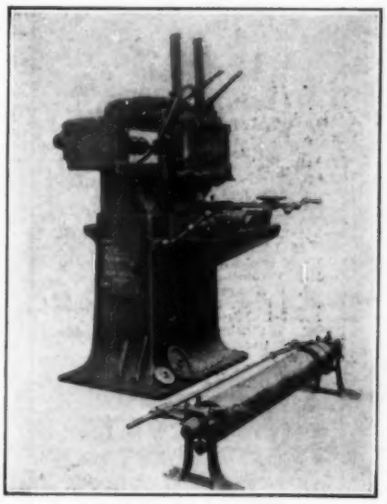

Twenty-five

2-Spindle Profilers

Complete

Same as New

$160.00 Each

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Warehouse and Offices,
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MOREY COLUMN
Quality, Dependable MACHINERY

BORING MILLS
Horizontal and Vertical

1—No. 1 Cleveland Horizontal.
1—No. 2 Rockford; Hor.
2—NEW No. 35 Landis Horiz. boring, milling and drilling machines.
3—24-in. Bullard New Era Type Vertical Turret Lathes.
1—34-in. King Vertical Turret Lathe.
1—30-in. Rogers & Hemphill Vertical
1—44-in. Niles-Bement-Pond 2-hd., Vert.
1—44-in. Putnam, 2-hd. Vert., latest type.

RADIAL DRILLS
1—6-ft. Bickford Universal; S.P.D.
1—6-ft. Baush Plain; belt drive.
1—6-ft. Reed-Prentice Plain; S.P.D.
1—6-ft. N-B-P Semi-Universal; S.P.D
1—4-ft. Reed-Prentice Plain; S.P.D.
1—3½-ft. Dreses S.P.D.
4—Hammond high-speed sensitive.

DRILL PRESSES
4-, 5- and 6-spindle Allen H.S.
4—NEW 36-in. Snyder upright.
10—NEW 20-in. Champion.
2—NEW Turner Vert. Drills, with tapping attachment.

LATHES
11—NEW 9 x 4, Star.
2—NEW 9 x 5, Star.
8—NEW 11 x 4, Star.
20—NEW 11 x 5, Star.
8—NEW 11 x 6, Star.
6—NEW 12 x 6, Star.
15—NEW 13 x 6, Star.
1—NEW 13 x 8, Star.
14—NEW 13 x 10, Star.
1—14 x 6 Hendey with Taper Attach.
1—14 x 6 P. & W. tool room lathe.
3—21 x 10 LeBlond S.P.D., geared hd.
1—NEW 21 x 14 South Bend Gap.
1—NEW 24 x 14 South Bend Gap.
2—24x14 Baye & Emmes D.B.G., Q.C.G.
2—NEW 24 x 10 Ryerson; cone drive.
1—24 x 12 Reed-Prentice . S.P.D.
2—NEW 30 x 30 LeBlond, geared hd.; triple speed motor drive.
3—42 x 32 Bridgeford heavy duty; all geared head; 3 carriages.

PLANERS
1—48 x 48 x 12-ft.—2-head Putnam.
1—36 x 36 x 14 Cinn., 2-hd. motor drive
1—36 x 36 x 12 W. & P., 4-head.
6—26 x 26 x 8-ft.—2-head Putnam.
1—26 x 26 x 10-ft.—1-head Pond.

TURRET LATHES
20—NEW 1-in., Biggs Wire Feed.
12—3 x 36 Jones & Lamson; geared head.
1—3 x 36 J & L double spindle Flat.
4—2¼-in. x 36 Greenlee.
6—No. 1B Foster Universal.
3—No. 3-A Warner & Swasey.
7—No. 4 Foster. Plain. Head.

AUTOMATICS
10—No. 00 Brown & Sharpe auto.
3—No. 00G Brown & Sharpe auto.
4—No. 0 Brown & Sharpe auto.
2—No. 2 Brown & Sharpe forming.
2—No. 515 Natl. Acme Auto.
2—No. 52 Natl. Acme Auto.
2—No. 56 Natl. Acme Auto.
11—2¼-in. Gridley Auto.

MILLING MACHINES
1—No. 2 Rockford Univ., S.P.D.
1—No. 3 Cincinnati Vertical.
1—No. 1 Kempsmith Plain.
1—No. 3 Brown & Sharpe Plain, S.P.D.
1—No. 3-B Milwaukee Plain.
1—No. 5 Cincinnati Plain, Rect. Arm.
1—No. 3 Garvin Duplex.
1—NEW No. 3-A Becker Ver.
5—No. 5-C Becker Ver.
1—Model C Becker Ver.
1—No. 2 Brown & Sharpe Ver.
1—No. 3 Cincinnati Ver.
1—No. 4 LeBlond plain.
10—3 in. and 4 in. P & W Spline.
Also 250 Hand and Mfg. Millers.
No. 6 Whitney, No. 12 Pratt & Whitney
1—No. 4 LeBlond plain.
1—No. 33 Kempsmith heavy duty.

MISCELLANEOUS
1—2-in. National agle.-hd. Bolt Threader.
2—1-in. Acme, Double Bolt Threaders.
1—54-in. (Eberhardt Bros.) Gear Cutter.
1—24-in. S. & S. Gear Hobber.
1—1100-lb. Erie Steam Hammer.
1—⅜-in. Cap. 48-in. throat QUICK-WORK Rotary Shear.
1—No. 3 L. & A. 48-in. throat Shear.
1—No. 4 Lapointe Broaching Machine.
3—NEW 15-in. Newton Slotters.
3—No. 6 Fellows gear shapers.
2—No. 3 26-in. Cincinnati Gear Cutters.
2—Norton crank balancing machines.

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9-in. x 18-in. Taper, Porter-Cable.
14-in. and 16-in. x 8-ft. Whitcomb, Q.C.
17-in. x 6-ft. and 8-ft. LeBlond Geared Heads.
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24-in. x 24-ft. Niles.
26-in. x 10-ft. Pond, 220-v., D.C. Motor.
28-in. x 12-ft. Pond.
28-in. x 18-ft. Niles Taper.
32-in. x 17-ft. Pond, T.G.
36-in. x 12-ft. Pond, T.G., 220-v., D.C. Motor.
36-in. x 17-ft. Pond Taper, 220-v., D.C. Motor.
36-in. x 20-ft Pond 220-v., D.C. Motor.
36-in. x 28-ft. Bement, T.G.
42-in. x 17-ft. Pond, T.G., 220-v., D.C. Motor.
42-in. x 20-ft. Niles, T.G.
48-in. x 24-ft. Pond Geared Head, 220-v., D.C. Motor.
48-in. x 30-ft. Niles, T.G.
50-in. x 17-ft. Miles (Old Style).
54-in. x 28-ft. American, T.G., 220-v., D.C. Motor.
63-in. x 40-ft. Bement, T.G.

PLANERS AND SHAPERS
20-in. G. & E. Shaper.
20-in. Stockbridge Shaper.
20-in. x 20-in. x 6-ft. Bement.
24-in. x 24-in. x 6-ft. Powell.
24-in. x 24-in. x 6-ft., 8-ft. and 10-ft. Whitcomb B.
26-in. x 26-in. x 6-ft. Gray.
30-in. x 30-in. x 6-ft and 10-ft. Pond, 2 Heads.
30-in. x 30-in. x 6-ft. to 12-ft. Pond, Reversing Motors.
36-in. x 36-in. x 10-ft. to 16-ft. Niles.
36-in. x 36-in. x 12-ft. to 16-ft. Pond, Reversing Motors.
36-in. x 36-in. x 24-ft. Bement.
42-in. x 42-in. x 14-ft. Bement.
42-in. x 42-in. x 36-ft. Pond, Reversing Motor.
48-in. x 48-in. x 16-ft. Pond, Reversing Motor.
48-in. x 48-in. x 20-ft. Bement, Belt.
54-in. x 36-in. x 10-ft. Bement, Belt.
50-in. x 36-in. x 22-ft. Pond, Reversing Motor.
54-in. x 54-in. x 12- to 22-ft. Pond, Rev. motors.
60 in. x 60-in. x 14 ft. to 24 ft. Niles, Belt.
72-in. x 72-in. x 12 ft. Bement, Belt.
72-in. x 60-in. x 14-ft. Bement, Reversing Motor.
72-in. x 72-in. x 20-ft. Ridgway, Forge, Reversing Motor.
76-in. x 76-in. x 26-ft. Pond, Reversing Motor.
10-ft. x 10-ft. x 36-ft. Betts, 220-volt, D.C. Motor through belts.

MILLERS AND GEAR CUTTERS
No. 2-A B & S Universal.
No. 2-B Single Pulley Plain, B. & S.
No. 4 Plain, Cone Pulley, LeBlond.
No. 4 Plain, Cone Pulley, B. & S.
No. 5 Plain, Cone Pulley, B. & S.
No. 5 Vertical, Cone Pulley, B. & S.
6 x 48 to 132 in. P. & W., Old Style Thread Millers.
14-in. No. 5-A Lees-Bradner Gear Generator.
15-in. Gleason Bevel Gear Generator.
16-in. Cincinnati Gear Hobber (New).
36-in. to 60-in. B & S Spur Gear Cutters.
No. 3—36-in. Newark, 220-volt, D.C. Motor.
No. 4—48-in. Newark, 220-volt, D.C. Motor.
No. 55—36-in. Newark Heavy Pinion, 220-volt, D.C. Motor.

DRILLING MACHINES
1-Spindle Pierle BB.
32-in. Aurora Tap. Att.
40-in. Aurora Tap. Att.
4-ft. Bickford Speed Box Radial.
5-ft. Niles Full Universal Speed Box.
5-ft. Ridgway, 20-volt, D.C. Motor.
6-ft. Pond, 220-v., D.C. Motor.
6-ft. Niles, Full Universal, Speed Box.
12-Spindle No. 13 P & W Multiple.

BORING MACHINES
36-in.—44-in. Niles Side Head Mill.
51-in. Niles Mill, with Turret Head.
60-in. Bement B & T Mill.
72-in. Ridgway, 220-volt, D.C. Motor.
10-ft. Niles, 220-volt, D.C. Motor.
10-ft.-16-ft. Niles, 220-volt, D.C. Motor.
2½ and 3-in. Lucas, Horizontal.
4½, 5 and 6½-in. Niles Floor Borers.
2½ to 4⅝-in. Horizontal Boring and Drilling Machines.

EVERY ONE A BARGAIN

MILLERS AND SHAPERS
1—No. 2B Milwaukee Universal Miller.
1—No. 2 Van Norman Duplex Miller.
1—No. 1½ Cincinnati Universal Miller.
No. 5 Brainard 60-in. table mtr. dr. Miller.
2—Becker-Lincoln Type Millers, $125 each.
2—16-in. Gould & Eberhardt B.G. Shaper.
2—30-in. Smith & Mills B.G. Shaper.

LATHES
2—Hendey, 16 x 8, late type.
2—Monarch 14 x 6 Lathes, taper attachment, latest type.
2—14-in. x 6-ft. Walcott Lathes, new, Q.C.G., D.B.G.
2—16 in. American Fox Lathes.
6—LeBlond 19 x 8, Q.C.G., D.B.G. Like new.

DRILLS AND GRINDERS
6—New Excelsior, 14-in. sensitive.
9—Buffalo 20-in. B.G. drill, new.
5—No. 11 B. & S. plain grinders, late type.

PRESSES
14—V & O 101 Presses, 5-in. stroke.
9—V & O 102, 5-in. stroke, dial feed.
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2—No. 6 Leffler Double Action Presses.
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MISCELLANEOUS
3—Model G. Cleveland Automat. ⅜-in., like new.
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4—No. 5 Foster F. B. G. Turret Lathes, like new.
1—No. 105½ Bliss Metal Slitter.
2—No. 1 B. & S. Semi-Auto. Screw Machines.
1—No. 1 Gray Sheet Metal Cutter.
1—1½-in. Pratt & Whitney Screw Machine, lot of equipment.

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Lathes, Screw Machines, etc.
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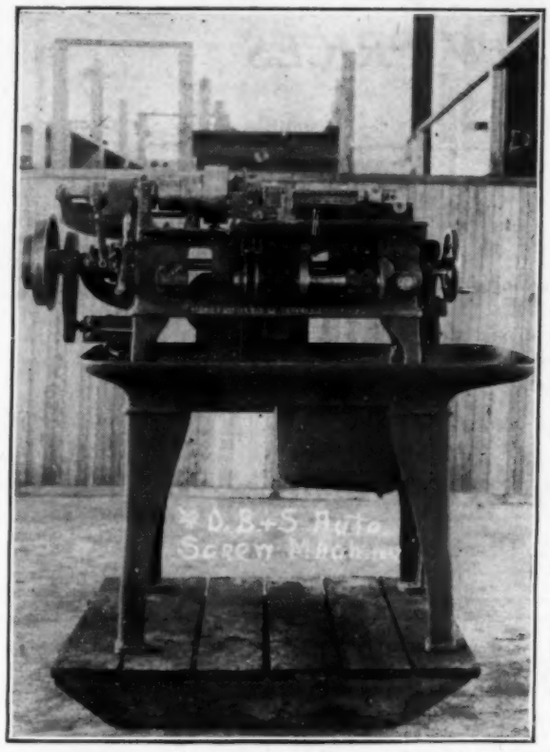

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96 x 37 Fifield, 27 ft. centers.
68 x 40 Pond, 30 ft. centers.
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1100 lb. Steam Single Frame Open Type.
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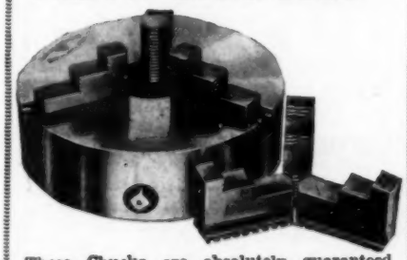

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2 Rail Heads.
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Overhead Countershaft.
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Lathe, LeBlond, 13 in. x 5 ft., collet attachment
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16 in. x 6 ft. cabinet legs with regular factory equipment. Send for photo.

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12-in. x 72-in. Norton Cylindrical Grinder.
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42-in. x 20-ft. Heavy Duty Triple Geared Engine Lathe, 12 ft. 6 in. between centers.
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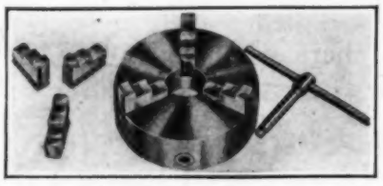

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With a stroke on drawing punch of 26 in.

Give full information

THE COLLIS CO., Clinton, Iowa

GUARANTEED NEW AT USED MACHINE PRICES

LATHES

3—14-in. x 6-ft. Whitcomb.
2—14-in. x 6-ft. Whitcomb, M.D.
5—16-in. x 8-ft. and 6-ft. Whitcomb.
4—18-in. x 6-ft.-8-ft. Whitcomb, G.H.
2—18-in. x 8-ft.-10-ft. Whitcomb, G.H.
5—20-in. x 8-ft.-10-ft.-12-ft. Whitcomb.
1—26-in. x 14-ft. Whitcomb, H.D.

Taper and other attachments can be applied to all.

MILLERS (Vertical)

2—2-H Becker.
7—3-H Becker.
4—AB-2 Becker.
1—Model "B" Becker and 1 Model SB.
8—Model "C" Beckers.
3—Model C-1 Beckers.
2—Model C-2 Beckers.
3—Model AC8 Beckers.

All with or without ROTARY att. Partial list.

McCOY BRANDT MACHINERY CO.
210-14 Penn Ave., Pittsburgh, Pa.

LARGE STOCK OF NEW

H. S. MILLING CUTTERS, SLITTING & SCREW SLOTTING SAWS, ENDMILLS, COUNTERBORES, COLLETS, REAMERS.

Half Price or less. Send for Complete List.

PAUL FROILAND
Leyfred Terrace, Springfield, Mass.

WANTED

GUN DRILLING MACHINE

With capacity for ¾-in. diameter hole, 44 in. long. Pratt & Whitney. No. 1½ preferred.

WRIGHT AERONAUTICAL CORP.,
Paterson, N. J.

New No. 2 Ohio Plain Miller, New.
16-in. x 9-ft. Lehmann QCG Lathe.
16-in. x 8-ft. Oliver QCG Lathe.
18-in. Prentice Turret Lathe.
24-in. x 24-in. x 8-ft. Putnam Planer, 2 heads.
1-in. Pratt & Whitney Screw Machine.
2—No. 5 Hendey Lincoln Millers.
No. 13 Brown & Sharpe Universal Grinder.
Harry F. Allen, 30 Church St., New York

WANTED TO BUY
USED

PIPE THREADING MACHINE

1—6-in. also 1—12-in. capacity, good condition only.

KINGHAN MACHINE SHOP
Enid, Okla.

FOR SALE

Bevel Gear Planer

Gleason Generating Type, 11 in. Late type, all complete, fine condition, immediate delivery at one-third present cost.

G. L. SIMPSON
P. O. Box 1125, Pittsburgh, Pa.

Your Shop's Most Interesting Corner

It's probably an eye-sore to you—that mass of dust covered and cob-webbed equipment in the corner.

But to the man who can use the machinery you have stored there, it may be the most interesting corner of your shop.

If the tools are in good condition, though dusty, there is a market for them. Tell prospective buyers everywehere what you have to sell.

You can reach the largest number at small cost through an advertisement in the

Searchlight Section of *American Machinist*

10 in. x 36 in.

NORTON GRINDER

Plain Grinder with countershaft, slightly used. Offered at a big saving.

MILES MACHINERY CO., Saginaw, Mich.

GRAND RAPIDS SPECIALS

1—9-in. Porter Cable Manufacturing Lathe.
1—9-in. Sunstrand Mfg. Lathe; 1—16-in. Chard Prod. Lathe; 1—16x7 Oliver QCG Lathe.
1—24x10 Schumacher-Boye Std. Lathe.
1—6-spindle Rockford 14-in. Gang Drill.
1—No. 2 Rockford High Power Miller.
1—No. 2 H. Becker Vertical Miller.
1—30x30x8 Pond Planer.

Ask for complete list.

McMULLEN MACHINERY CO.
Grand Rapids, Mich.

SEARCHLIGHT SECTION

USED EQUIPMENT AND NEW

Offered for Re-sale

Space for these advertisements is sold by the advertising inch—30 inches to a page. The price per inch is based on total space used—multiply ad space by number of insertions.

RATE PER INCH:
1 to 3 inches.....$5.00 an inch
4 to 7 inches..... 4.80 an inch
8 to 14 inches..... 4.60 an inch

An inch is measured vertically on one column—three columns to a page. Any space may be used measured by the even inch in height by 1, 2, or 3 columns in width.

RATES FOR LARGER SPACES, OR SPACE ON A YEARLY BASIS, FURNISHED ON REQUEST.

Am. Mach.

POSITIONS VACANT

Delaware

ESTIMATOR for customs machine shop and foundry; location Wilmington, Del.; must have had several years' experience in machine shop and foundry estimating and have the ability to direct the preparation of estimates for this kind of work. Reply must state fully past experience, present employment and salary expected. P-35, Am. Mach., Real Estate Trust Bldg., Philadelphia, Pa.

Illinois

MECHANICAL draftsman wanted, with experience in the design of automatic machines and fixtures; technical graduate preferred, but consideration will also be given to intelligent experienced man without technical training; location 25 miles from St. Louis, Mo. State age, education, experience and salary expected. Address P-44, Am. Mach., Old Colony Bldg., Chicago, Ill.

STEEL engraver, who can also do tool work. Please state age, qualifications and wages expected. Courteous consideration will be given your application by growing company in Middle West. Address P-33, Am. Mach., Old Colony Bldg., Chicago, Ill.

Pennsylvania

HIGH grade machinist, a thorough mechanic, capable of operating modern machine tools in an efficient and up-to-date manner and capable of developing and applying jigs and fixtures in the production of power transmitting machinery. P-50, Am. Mach., Real Estate Trust Bldg., Philadelphia, Pa.

MACHINIST, familiar with modern methods of machine tool assembly, to act as working sub-foreman. P-51, Am. Mach., Real Estate Trust Bldg., Philadelphia, Pa.

WANTED, a working foreman, for a small machine shop equipped for contract work and jobbing; a capable mechanic of good character to come up with the business. Write us frankly about yourself and your expectations. Morehouse Machine Co., York, Pa.

Vermont

DRAFTSMAN on textile machinery wanted; permanent situation; one who has worked on cloth finishing machinery preferred. Give age, experience and terms. P-34, Am. Mach., 10th Ave. at 36th St., New York City.

Wisconsin

ADVERTISING man on machine tools. State age, schooling experience and salary expected. P-48, Am. Mach., Old Colony Bldg., Chicago, Ill.

SALES correspondent, with experience on machine tools. State age, experience and salary expected. P-49, Am. Mach., Old Colony Bldg., Chicago, Ill.

EMPLOYMENT AGENCIES

GENERAL ENGINEERING AGENCY, Pittsburgh. Serving employers everywhere, overnight proposals, gratis, require Works Managers, Superintendents, Chief Draftsmen, Designers, Plant Engineers, Master Mechanics, Tool Draftsmen, Salesmen, Foundry, Forge, Machine Shops, General Office.

EMPLOYMENT SERVICE

SALARIED POSITIONS, $2,500 to $25,000 upward; executive, technical, administrative, engineering, manufacturing, professional, managing, financial, etc., all lines. If you are qualified and receptive to tentative offers for a new connection, you are invited to communicate in strict confidence with the undersigned, who will conduct preliminary negotiations for such positions. A method is provided through which you may receive overtures in confidence without jeopardizing present connections and in a manner conforming strictly to professional ethics. Send name and address only. Preliminary particulars will be sent without obligating or compromising you in any way. R. W. Bixby, Inc., 407 Lockwood Bldg., Buffalo.

POSITIONS WANTED

New Jersey

DRAFTSMAN, designer, European mechanical engineer; age twenty-six; five years high technical schools; six years' experience on tool machines, toolmaking, automobile and electric motors; knowledge of forge, foundry, patternmaking, processes; able to save workmanship and material; available immediately; salary expected $2,000. PW-46, Am. Mach., 10th Ave. at 36th St., New York City.

Assistant to President

The president of a company manufacturing light office appliances is in need of an assistant skilled as an engineer and designer along similar lines, and possessing proven executive ability as well.

He must have tact and be able to adapt himself to local conditions. He must be at least 35 and not more than 45. He must be able to show a clean record and that he has done things worth while. Give full particulars in first letter, which will be kept in strict confidence and returned if desired.

P-40, American Machinist, 1570 Old Colony Bldg., Chicago, Ill.

We Want a Mechanical Engineer Who Can Do This:

1st: Design high-grade office and printing machinery.
2nd: Follow latest machine shop, foundry and pattern shop practice.
3rd: Be original, tactful and have executive ability.
4th: Be big and broad enough to work in perfect harmony with other men.
5th: Show that your experience and ability justifies the salary you ask.
6th: Show several years of experience in same or similar line of work.

Give full particulars in first letter which will be kept confidential.

P-39, American Machinist, 1570 Old Colony Bldg., Chicago, Ill.

WANTED

Inspector and Foreman

Experienced **Inspector** familiar with heavy **work.** Also **Foreman** to take charge of heavy tools. Apply

THE TOLEDO MACHINE & TOOL CO.
Dorr St. & N. Y. C. Railroad, Toledo, Ohio.

EXECUTIVES

Qualified men—Technical, Commercial and Manufacturing—seeking new positions find our effective and confidential service extremely satisfactory. Our Mr. H. H. Harrison can negotiate a suitable connection for you as he has done for thousands of others since 1900. Inquiries invited; confidences respected.

THE NATIONAL BUSINESS BOURSE, Inc.
Confidential Negotiators
Association Building, Chicago

POSITIONS WANTED

New York

DO YOUR 1922 results satisfy you? I have had fifteen years' experience in the quantity production of sheet metal products. If your problem is along this line of manufacture it will pay you to investigate. Address General Machanger, PW-43, Am. Mach., 10th Ave. at 36th St., New York City.

DRAFTSMAN, twenty-five; mechanical designer; seven years' experience; engineering training. PW-30, Am. Mach., 10th Ave. at 36th St., New York City.

EXECUTIVE, age thirty-seven, wide experience in the manufacturing of dies, tools and fixtures, also heavy machinery, desires similar position. PW-28, Am. Mach., 10th Ave. at 36th St., New York City.

WORKS executive; twenty years' experience, starting as a molder in the foundry, working through the machine shop, then becoming superintendent; have handled male and female help for a number of years; available immediately. PW-21, Am. Mach., 10th Ave. at 36th St., New York City.

Ohio

FOREMAN, automatics and hand screw machines; American, thirty-four years of age; ten years setter and foreman of screw machine products; reference furnished upon request. PW-25, Am. Mach., Leader-News Bldg., Cleveland, Ohio.

MASTER mechanic, now employed but would like to change, having twenty years' experience maintainence and construction work, especially qualified for power plants and heavy duty steam and electric cranes; location not essential; execellent references; negotiations confidential. PW-17, Am. Mach., Leader-News Bldg., Cleveland, Ohio.

MAINTENANCE, construction engineer, fifteen years' experience in charge of buildings, machinery, equipment, power, plant layout and plans for buildings, American, age forty-four, married, wishes position with metal or wood working plant; open for position Jan. 1; best of references; any location. PW-45, Am. Mach., Leader-News Bldg., Cleveland, Ohio.

Oklahoma

WANTED—An opportunity to improve following record: $8,400 per year, 40 per cent reduction power costs; $2,000 per year, 50 per cent reduction heating costs. Above is record of works engineer desiring larger opportunities in larger industrial plant. PW-42, Am. Mach., Old Colony Bldg., Chicago, Ill.

Pennsylvania

POSITION as assistant to president or as manager, clean-cut executive, business man and mechanic, with the necessary experience to handle any large proposition. PW-937, Am. Machinist, Real Estate Trust Bldg., Philadelphia, Pa.

SALES work desired by mechanical designer; experienced on tools, special machines and conveyors; age twenty-seven. PW-47, Am. Mach., Real Estate Trust Bldg., Philadelphia, Pa.

In Replying to "Blind" Ads

be careful to put on envelope the key number in the ad and also local address of office to which reply is sent.

10th Ave. at 36th St., New York.
509 Real Estate Trust Bldg., Phila.
533 Leader-News Bldg., Cleveland.
1570 Old Colony Bldg., Chicago.
531 Rialto Bldg., San Francisco.

Important

Original letters of recommendation or other papers of value should not be enclosed to unknown correspondents — send copies.

0195

SALESMEN WANTED

Machine Tool Salesman Wanted

Preferably man having had experience in handling and operating power presses and shears, also dies. State age, experience and salary expected. Preference given to resident of Cleveland or Detroit. SW-37, Am. Mach., 10th Ave. at 36th St., New York City.

Machine Tool Salesman Wanted

Give experience pertaining to garage equipment; state lines sold, age, past and present firms employed. Address Auto Equipment Co., Denver, Colo.

AGENCIES AVAILABLE

Manufacturer's Agent

Iron, steel and contractor's equipment; established offices in Philadelphia; would like to take on additional line to follow up inquiries or leads and do some missionary work. A-41, Am. Mach., Real Estate Trust Bldg., Philadelphia, Pa.

REPRESENTATION WANTED

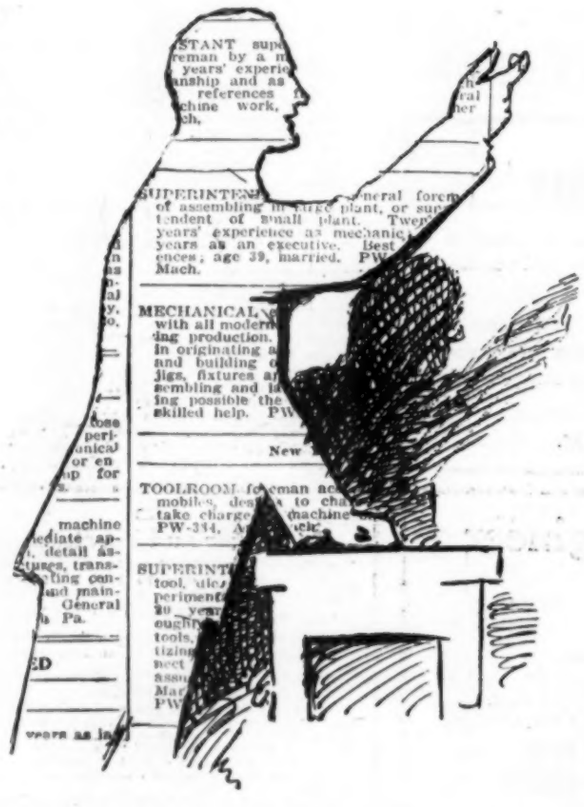
Shop Representative

Wanted in your city to sell K. T. W. taper caipers and clamps. You will find these ready sellers and indispensable tools. Write for prices; generous commission. Knauel Tool Works, 210 5th Ave., Rock Island, Ill.

PATENT ATTORNEYS

PATENTS. C. L. Parker, patent attorney, McGill Bldg., Washington, D. C. Inventor's handbook sent upon request.

PATENTS—Send for form "Evidence of Conception" to be signed and witnessed. Form fee schedule, information, free. Lancaster and Allwine, 262 Ouray Bldg., Washington, D. C.



"SEARCHLIGHT" Want ads Talk—

They go direct to those in the industry you wish to reach and tell your story in a forceful and business-like way.

They don't mince words but get right to the point.

Use them for—

Agencies Wanted
Agents Wanted
Auction Notices
Bids Wanted
Books and Periodicals
Buildings For Sale
Business Opportunities
Civil Service Opportunities
Contracts to be Let
Contracts Wanted
Desk Room For Rent
Desk Room Wanted
Educational
Employment Agencies
Foreign Business
For Exchange
For Rent
Franchises
Help Wanted
Industrial Sites
Labor Bureaus
Machine Shops
New Industries Wanted
Partners Wanted
Patent Attorneys
Patents For Sale
Plants For Sale
Positions Vacant
Positions Wanted
Proposals
Property For Sale
Receivers' Sales
Representatives Wanted
Salesmen Wanted
Specialties
Sub-Contracts Wanted
Water Front Property
Work Wanted

Miscellaneous for Sale, for Rent or Want Ads

For Every Business Want "Think SEARCHLIGHT *First"*

0144

Manufacturers—

A "Who's Who" That Can Save You Many a Bag Full of Correspondence

There are various ways to select contract shops—the most costly is the broadcast use of Uncle Sam's mail.

Hundreds of letters are often sent, the replies sifted and fruther correspondence indulged in before a small select list of contract work shops is ready for your real purpose.

Why not start out where the "hit or miss" plan leaves off—why not take the *always live* list of reliable, progressive specialists—the firms listed in the

CONTRACT WORK SECTION
of the
AMERICAN MACHINIST

There is no Dun's nor Bradstreet's that can help in your search—the Contract Work Section of the **American Machinist** is all the "Who's Who" you need. When a shop advertises its facilities consistently in the authoritative publication of the machine-making field—its advertised good name is your hostage.

Turn each week to the Contract Work Section

Contract Work

OUR PRODUCT—IN PICTURES

THIS Automatic Bag Tying Machine will tie from fifteen to forty flour bags per minute, depending upon the size of the bags.

NOTE—This is No. 13 of a series of photographs showing some of the special machines which we have manufactured for our customers.

SPECIAL MACHINERY AND PARTS TOOLS AND FIXTURES

ESTIMATES PROMPTLY FURNISHED

THE HARTFORD SPECIAL MACHINERY CO., Hartford, Conn.

TOOL WORK AND CONTRACT WORK

Our organization, with its years of experience, complete equipment, and high standards of workmanship is your guarantee of statisfaction on tool and machine work.

METAL STAMPINGS SCREW MACHINE WORK

These departments of our Plant are equipped to turn out all kinds of stampings and screw machine products of the highest quality at the right prices; also to manufacture novelties and appliances complete.

Send us your blue prints or samples. We'll be glad to quote you.

NATIONAL BLANK BOOK CO.
116 Riverside, Holyoke, Mass.

CASTINGS

BRASS, BRONZE AND ALUMINUM MACHINE WORK.

THE COLUMBUS BRASS COMPANY
540 DUBLIN AVE., COLUMBUS, OHIO

Well Equipt Repair Shop

Desires Contract Work

FOR

Lathes up to 48 in. Planer and Miller.

FRANKLIN MACHINE WORKS
Steubenville, Ohio

Special Machinery and Machining of Parts

A modern factory with new Machine Tools, Heat-Treating Department, Tool Room and Pattern Shop, Foundry and Forging Service. Complete facilities from engineering to shipping. An experienced organization, manufacturers of high-grade turret lathes, is ready to assume your manufacturing problems, from machining parts to designing and building complete machines.

Quality work by modern methods.

Millholland Machine Company
1106 West Twenty-Third St.
Indianapolis, Ind ana

LIGHT MANUFACTURING

TOOLS DIES

GENERAL MACHINE WORK

Semi-production work. Special machines developed and built. Engineering department and skilled tool-makers specializing in dies for metal stampings. Our best recommendation—we are always busy.

625 North 3rd Street – Newark, N.J.
BEAVER Machine & Tool Co., Inc.

WE SPECIALIZE

on tools that incorporate the Five Fundamental Tool Virtues. As a result we offer to make for you:

Tools that are time saving.
Tools that are foolproof.
Tools that are easy to manipulate.
Tools that will give largest possible production.
Tools that will give absolute interchangeability.

Send your difficult tool work to us. We specialize in hard work such as the average toolroom has difficulty in handling. Use our facilities as if they were your own.

ARTHUR BROCK, JR. TOOL & MFG. WORKS
533 North 11th Street, Philadelphia, Pa. U. S. A.

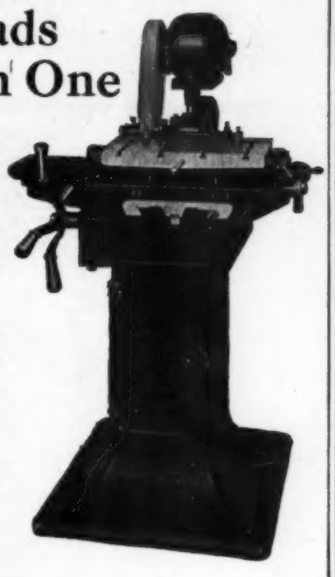
WE SPECIALIZE IN THE DESIGN AND MANUFACTURE OF

Jigs—Fixtures—Ring, Plug and Snap Gauges—Special Machines — Blanking — Piercing—Drawing—Forming and Sub Press Die Work

Send Blueprints for Estimates

THE COLUMBUS DIE, TOOL AND MACHINE COMPANY
COLUMBUS, OHIO

When Two Heads Are Better Than One



When you accept that contract that is just a little out of your regular line, you'll want some special jigs and machines. Maybe you feel the need of a little advice from some one who has had experience in the handling of such work. It is a case where two heads are better than one.

We are competent to be your second head because we are experts in the manufacture of special tools, machines and parts of all kinds. The illustration shows our Universal Gauge Grinder, a machine of micrometric precision and one of our regular products. The same engineers, the same skill, and the same perfect finish will contribute to the carrying out of *your* requirements, whether it be special jigs, parts, or a lathe that you want.

The STEEL PRODUCTS ENGINEERING COMPANY
SPRINGFIELD, OHIO

IT PAYS TO MAKE GOOD TOOLS

Metal Stampings

Dies and Tools
"Barth" Service

BARTH STAMPING & MACHINE WORKS
3815 West 34th Street, Cleveland, Ohio

TRADE MEHL MADE MARK

HIGH-GRADE

Jigs, Fixtures, Dies, Gauges and Special Machines

Send for free illustrated prospectus

MEHL MACHINE TOOL & DIE CO.
ROSELLE, N. J.
Established 1913

Thirty Minutes from New York City

Complete Pressed Metal Service

Beginning with the drawings for the dies, through the stages of stamping, then welding or riveting, down to polishing and plating; GLOBE service is quick, complete and economical.

Experts plan it and supervise it from start to finish.

May we estimate for you?

The Globe Machine & Stamping Co.
Cleveland, Ohio

MACHINE WORK WANTED

FRANKLIN MACHINE CO.
Engineers, Founders and Machinists
Providence, R. I.

Textile machinery, heavy machinery, special machinery of all kinds.

The Harris-Corliss Steam Engines.

Eastern Representative for Cleveland Worm Gears and Worm Gear Reduction Units

DESIGNERS AND BUILDERS OF SPECIAL MACHINERY.
PARTS MANUFACTURED IN QUANTITIES.

LINCOLN MACHINE COMPANY

PAWTUCKET, R. I.

SPECIAL MACHINERY
BUILT TO ORDER

We have splendid facilities for producing special machinery of all kinds, and are prepared to guarantee satisfaction—both as regards workmanship and price. We have foundry facilities and an up-to-date machine shop. Send us blue-prints and give us an opportunity to quote you price. We can save you money.

Lambert & Todd Machine Co., Camden, N. J.

DIE COSTS LOWERED

KELLER AUTOMATIC MACHINES
CUT ANY SIZE DIES
KELLER MECHANICAL ENGRAVING CO.
76 WASHINGTON ST. BROOKLYN, N.Y.

Special and Standard High Grade Machinery

Jigs, Tools, Fixtures, Punches and Dies

Jobbing Specialists

AMERICAN MACHINE & FOUNDRY COMPANY
Contract Department
5524 Second Avenue, Brooklyn, N. Y.

Hardened and Ground Parts Special Machinery and Tools

Shackle Bolts, Bushings, Motor Car Parts
Quantity Production.
Complete Tool Room Facilities
Mail prints for estimates
The Deckard-Mitchell Engineering Co.
412 Frankfort Ave., Cleveland, Ohio.

Want Any? CONTRACT WORK Any to Let?

SPECIAL LABOR-SAVING MACHINERY

Jigs and Fixtures for interchangeable manufacturing. Punches and Dies for all kinds of Metal Stampings. Gauges. Special Tools. Machine work to order.

SIMPLEX TOOL COMPANY
Designers and Builders
Woonsocket, R. I.

WHAT AND WHERE TO BUY

A Classified Index of Advertisers in This Issue

For Alphabetical Index See Last Page

Abrasive Discs
Besly & Co., Chas. H., Chicago
Carborundum Co., Niagara Falls
Gardner Mch. Co., Beloit

Abrasive Materials
Carborundum Co., Niagara Falls
Dickinson, Thos. L., N. Y.
Gardner Mch. Co., Beloit
Norton Co., Worcester
Safety Emery Wheel Co., Springfield, O.
Vitrified Wheel Co., Westfield

Accumulators, Hydraulic
Elmes Eng. Wks., Chas. F., Chicago
Watson-Stillman Co., N. Y.

Aftercoolers, Air
Chicago Pneu. Tool Co., N. Y.
Ingersoll-Rand Co., N. Y.

Air Lifts
Sullivan Machinery Co., Chicago.

Air Operated Countershafts
Hannifin Mfg. Co., Chicago

Air Operated Mandrels
Hannifin Mfg. Co., Chicago

Air Operated Vises
Hannifin Mfg. Co., Chicago

Air Receivers
Chicago Pneu. Tool Co., N. Y.

Arbors
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Milling Mach. Co.
Cochrane-Bly Co., Rochester
Cushman Chuck Co., Hartford
National Twist D. & T. Co., Detroit.
Nicholson & Co., W. H., Wilkes-Barre
Standard Eng. Wks., Pawtucket
Union Mfg. Co., New Britain
Union Twist Drill Co., Athol
West Tool Co., Detroit
Whitney Mfg. Co., Hartford

Arbors, Ground Thread
Bath & Co., John, Worcester

Balancing Ways
Anderson Bros. Mfg. Co., Rockford

Ball Retainers
Bearings Co. of America, Lancaster

Balls, Brass, Bronze and Steel
Abbott Ball Co., Hartford
Auburn Ball Bearing Co., Rochester
Strom Steel Ball Co., Oak Park

Barrels, Tumbling
Abbott Ball Co., Hartford
Globe Mch. & Stamp Co., Cleveland
Royersford Fdry. & Mch. Co., Royersford

Bars, Boring
Davis Boring Tool Co., St. Louis
Hannifin Mfg. Co., Chicago
Marvin & Casler Co., Canastota
Underwood Corp., H. B., Phila.

Bars, Bronze Cored
Bunting Brass & Bronze Co., Toledo
Gisholt Mach. Co., Madison

Bearings, Ball
Aetna Ball Bearing Co., Chicago
Auburn Ball Bearing Co., Rochester
Bearings Co. of America, Lancaster
Boston Gear Wks., Norfolk Downs
Fafnir Bearing Co., New Britain
Norma Co. of America, N. Y.
R. I. V. Co., N. Y City
Schatz Mfg. Co, Poughkeepsie

Bearings, Bronze
Bunting Brass & Bronze Co., Toledo
Doehler Die Cast. Co., Brooklyn

Bearings, Die-Cast
Doehler Die Cast. Co., Brooklyn
Franklin Die Cast. Corp., Syracuse
Light Mfg. & Fdry. Co., Pottstown

Bearings, Journal
Bunting Brass & Bronze Co., Toledo
Columbus Brass Co., Columbus

Bearings, Roller
Norma Co. of America, N. Y.
Royersford Fdry. & Mch. Co., Royersford

Belt Cement
Schieren Co., Chas. A., N. Y.

Belt Clamps
Hoggson & Pettis Mfg. Co., New Haven

Belt Dressings and Fillers
Schieren Co., Chas. A., N. Y.
White & Bagley Co., Worcester

Belt Fasteners
Bristol Co., Waterbury

Belt Lacing
Schieren Co., Chas. A., N. Y.

Belt Shifters
LeBlond Mach. Tool Co., R. K., Cincinnati

Belt Tighteners
Jones Fdry. & Mch. Co., W. A. Chicago

Belting, Chain
Link-Belt Co., Chicago, Philadelphia
Morse Chain Co., Ithaca
Whitney Mfg. Co., Hartford

Belting, Endless
Brown Mfg. Co., Arthur S. Tilton

Belting, Leather
Schieren Co., Chas. A., N. Y.

Bench Legs
Brown & Sharpe Mfg. Co., Providence
Manufacturing Equip. & Mfg. Co., Framingham

Benches, Work
Manufacturing Equip. & Mfg. Co., Framingham

Bending Machines Power
Ryerson & Son, Jos. T., Chicago

Blocks
Simplex Tool Co., Woonsocket

Blocks, Chain (See Hoists, Hand)

Blocks, Pillow
Jones Fdry. & Mch. Co., W. A. Chicago

Blowers
American Gas Furnace Co., Elizabeth
Buffalo Forge Co., Buffalo
Chicago Flexible Shaft Co., Chicago
General Electric Co., Schenectady

Blue Print Paper
N. Y. Blue Print Paper Co., N. Y.

Blue Printing Machinery
N. Y. Blue Print Paper Co., N. Y.

Bolt & Nut Machinery
Acme Mchy. Co., Cleveland
Anderson Die Mch. Co., Bridgeport
Foote-Burt Co., Cleveland
Greenfield Tap & Die Corp., Greenfield
Landis Machine Co., Waynesboro
National Machinery Co., Tiffin
Pawtucket Mfg. Co., Pawtucket
Universal Mch. Co., Bowling Green
Victor Tool Co., Waynesboro

Bolt Threading Machinery
Williams Tool Corp., Erie

Bone for Case Hardening
Rogers & Hubbard Co., Middletown

Books, Technical
McGraw-Hill Book Co., N. Y.

Boosters
General Electric Co., Schenectady

Boring Bars, Expansion
Davis Boring Tool Co., St. Louis

Boring and Turning Mills, Vertical
Betts Mch. Plant Cons. Mch. T. Corp. of America, Rochester
Bullard Mach. Tool Co., Bridgeport
Cincinnati Planer Co., Cincinnati
Gisholt Mach. Co., Madison
Newton Mch. T. Plant Cons. Mch. T. Corp. of America, Phila.
Sellers & Co., Wm., Philadelphia

Boring, Drilling and Milling Machines, Horizontal
Barnes Co., W. F. & John, Rockford
Baush Mch. T. Co., Springfield, Mass.
Betts Mch. Plant Cons. Mch T. Corp. of America, Rochester
Beaman & Smith Co., Providence
Gisholt Mach. Co., Madison
Landis Tool Co., Waynesboro
Lucas Mach. Tool Co., Cleveland
Moline Tool Co., Moline
Murchey Mch. & T. Co., Detroit
Newton Mch. T. Plant Cons. Mch. T. Corp. of America, Phila.
Pawling & Harnischfeger Co., Milwaukee
Rockford (Ill.) Drilling Mach. Co.
Sellers & Co., Wm., Philadelphia
Springfield (O.) Mach. Tool Co.
Vandyck Churchill Co., N. Y.

Boring, Drilling and Milling Mach., Vertical
Betts Mch. Plant Cons. Mch T. Corp. of America, Rochester
Knight Mchy. Co., W. B., St. Louis
Pawling & Harnischfeger Co., Milwaukee

Boring Heads
Davis Boring Tool Co., St. Louis
Lovejoy Tool Co., Springfield, Vt.
Marvin & Casler Co., Canastota

Boring Tools
Armstrong Bros. Tool Co., Chicago
Brown & Sharpe Mfg. Co., Providence
Davis Boring Tool Co., St. Louis
Hannifin Mfg. Co., Chicago
Haynes Stellite Co., Kokomo
Lovejoy Tool Co., Springfield, Vt.
Williams & Co., J. H., Brooklyn

Boxes, Tote (See Furniture, Machine Shop)

Broaches
Hurlbut Rogers Broach. Co., Hudson
Lapointe Co., J. N., New London
Lapointe Mach. Tool Co., Hudson

Broaching Machines
Lapointe Co., J. N., New London
Lapointe Mach. Tool Co., Hudson
Paramount Specialty T. Co., Waltham
Pawtucket Mfg. Co., Pawtucket

Bronze
Bunting Brass & Bronze Co., Toledo
Brown & Sharpe Mfg. Co., Providence

Bronze, Phosphor
Bunting Brass & Bronze Co., Toledo

Bucket Carriers, Pivoted
Link-Belt Co., Chicago, Philadelphia

Buffing or Polishing Machines (See Polishing and Buffing Machines)

Bulldozers
Toledo Mach. & Tool Co., Toledo

Burners, Oil and Gas
Advance Furnace & Eng. Co., Springfield, Mass.
Best Furnace & Burner Co., W. N., N. Y.
Johnson Gas Appliance Co., Cedar Rapids

Bushings
Bunting Brass & Bronze Co., Toledo
Columbus Brass Co., Columbus
Sterling Specialty Co., Newcomerstown

Cabinets, Tool
Armstrong Bros. Tool Co., Chicago

Calipers
Athol Mach. & Fdry. Co., Athol
Randall & Stickney, Waltham
Slocomb Co., J. T., Providence
Starrett Co., L. S., Athol

Cam Cutting Machines
Garvin Machine Co., N. Y.
Rowbottom Mach. Co., Waterbury
Walcott Lathe Co., Jackson

Cams
Rowbottom Mach. Co., Waterbury

Can-Making Machinery (See Sheet Metal Working Machinery)

Carbonizing Machines
American Gas Furnace Co., Elizabeth

Castings, Aluminum
Bunting Brass & Bronze Co., Toledo
Doehler Die Cast. Co., Brooklyn
Grey Mfg. Co., C. M., E. Orange
Light Mfg. & Fdry. Co., Pottstown

Castings, Brass and Bronze
Accurate Brass Casting Co., Brooklyn
Bunting Brass & Bronze Co., Toledo
Columbus Brass Co., Columbus
Doehler Die Cast. Co., Brooklyn
Light Mfg. & Fdry. Co., Pottstown

Castings, Die Molded
Doehler Die Cast. Co., Brooklyn
Franklin Die Cast. Corp., Syracuse
Light Mfg. & Fdry. Co., Pottstown

Castings, Iron
Athol Mach. & Fdry. Co., Athol
Brown & Sharpe Mfg. Co., Providence
Chisholm-Moore Mfg. Co., Cleveland
Franklin Mach. Co., Providence
Springfield (O.) Mach. Tool Co.
Whitcomb-Blaisdell Mach. Tool Co., Worcester

Castings, Malleable Iron
Link-Belt Co., Chicago, Philadelphia

Castings, Semi-Steel
Springfield (O.) Mach. Tool Co.

Centering Machines
Pawling & Harnischfeger Co., Milwaukee
Standard Eng. Wks., Pawtucket
Whiton Mch. Co., D. E., New London

Centers, Planer
Cincinnati Planer Co., Cincinnati

Chains (See Sprockets and Chains)

Chains, Driving
Baldwin Chain & Mfg. Co., Worcester
Diamond Chain & Mfg. Co., Indianapolis
Link-Belt Co., Chicago, Philadelphia
Morse Chain Co., Ithaca
Philadelphia Gear Wks., Phila.
Whitney Mfg. Co., Hartford

Chucking Machines
Brown & Sharpe Mfg., Co., Providence
Bullard Mach. Tool Co., Bridgeport
Cleveland (O.) Auto Mach. Co.
Gisholt Mach. Co., Madison
Jones & Lamson Mach. Co., Springfield, Vt.
Potter & Johnston Mch. Co., Pawtucket
Warner & Swasey Co., Cleveland

Chucks, Air
Frontier Chuck & Tool Co., Buffalo
Hannifin Mfg. Co., Chicago

Chucks, Centering
Cushman Chuck Co., Hartford

Chucks, Drill and Tap
Almond Mfg. Co., T. R., Ashburnham
Cushman Chuck Co., Hartford.
Horton & Son Co., E., Windsor Locks
Jacobs Mfg. Co., Hartford
Marvin & Casler Co., Canastota
Morse Twist D. & M. Co., New Bedford.
National Twist D. & T. Co., Detroit
Skinner Chuck Co., New Britain
Union Mfg. Co., New Britain.
Victor Tool Co., Waynesboro.
Whitney Mfg. Co., Hartford.
Whiton Mch. Co., D. E., New London

Chucks, Lathe
Almond Mfg. Co., T. R., Ashburnham
Bullard Mach. Tool Co., Bridgeport.
Cushman Chuck Co., Hartford.
Gisholt Mach. Co., Madison
Hoggson & Pettis Mfg. Co., New Haven
Horton & Son Co., E., Windsor Locks.
Simplex Tool Co., Woonsocket.
Skinner Chuck Co., New Britain
Union Mfg. Co., New Britain.
Whiton Mch. Co., D. E., New London

Chucks, Magnetic
Heald Mach. Co., Worcester

Chucks, Planer
Cincinnati Planer Co., Cincinnati.
Hoggson & Pettis Mfg. Co., New Haven.
Horton & Son Co., E., Windsor Locks.
Skinner Chuck Co., New Britain
Union Mfg. Co., New Britain.

Chucks, Quick Changing
American Equipment Co, Detroit
Geometric Tool Co., New Haven

Chucks, Split
Ames Co., B. C., Waltham.
Rivett Lathe & Grinder Co., Boston.
Stark Tool Co., Waltham
Wade-American Tool Co., Waltham

Chucks, Vertical Boring Mill
Bullard Mach. Tool Co., Bridgeport
Gisholt Mach. Co., Madison

Clamps, Machinists'
Armstrong Bros. Tool Co., Chicago.
Reed Mfg. Co., Erie.
Starrett Co., L. S., Athol.
Williams & Co., J. H., Brooklyn.

Cleaners, Metal, Waste, General
Oakley Chemical Co., N. Y.

Clocks, Time
Gisholt Mach. Co., Madison

Clutches, Friction
Brown Co., A. & F., N. Y.
Brown Eng. Co., Reading
Johnson Mach Co., Carlyle, Manchester.
Jones Fdry. & Mch. Co., W. A. Chicago
Link-Belt Co., Chicago, Philadelphia
Moore & White Co., Philadelphia

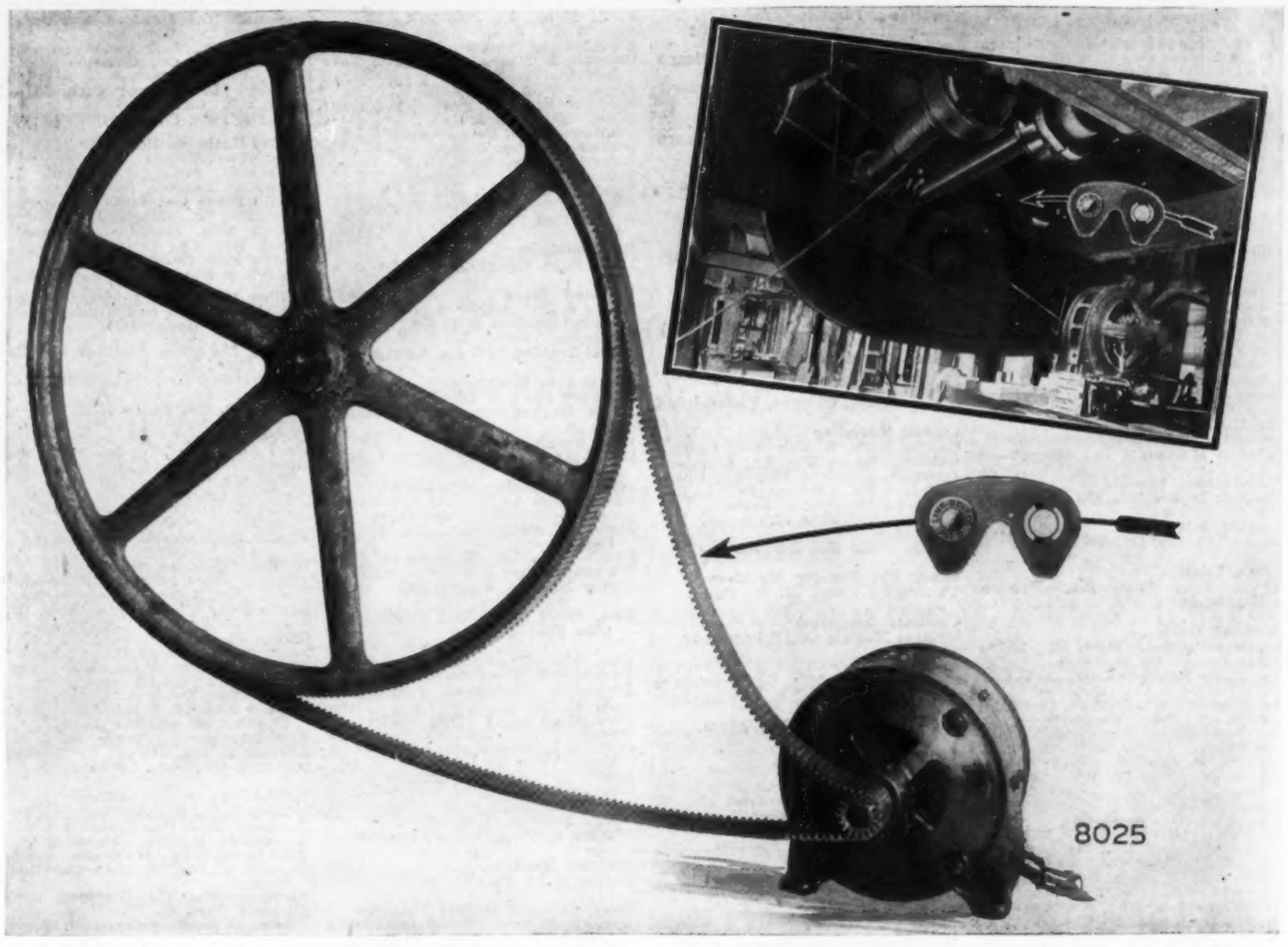
Coal and Ash Handling Machinery
Link-Belt Co., Chicago, Philadelphia

Coal Storage Systems
Link-Belt Co., Chicago, Philadelphia

Coils, Electric
General Electric Co., Schenectady

Collars, Shaft & Set
Royersford Fdry. & Mch. Co., Royersford

Collars, Spacing
Detroit Stamping Co., Detroit.



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Sullivan Machinery Co., Chicago.

Compressors, Electric
Black & Decker Mfg. Co., Baltimore

Conduit, Interior
General Electric Co., Schenectady

Cones, Friction
Evans Fric. Cone Co., Newton Highlands.

Contract Work
American Mch. & Fdry. Co., Bklyn
Ames Co., B. C., waltham.
Automatic Products Corp., I. L. City
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Bath & Co., John, Worcester
Beaver Mach. & Tool Co., Newark
Betts Mch. Plant, Cons. Mch. T. Corp. of America, Rochester
Brock, Jr., T. & M. Wks., Arthur, Phila.
Brown & Sharpe Mfg. Co., Providence
Columbus (O.) Brass Co.
Columbus (O.) Die T. & Mch. Co.
Deckard-Mitchell Eng. Co, Cleveland
Detroit Stamping Co., Detroit.
Earle Gear & Mach. Co., Phila.
Franklin Mch. Co., Providence.
Franklin Mach. Wks, Steubenville
Garvin Mach. Co., N. Y.
Gisholt Mach. Co., Madison
Grant Mfg. & Mch. Co., Bridgeport
Hartford Special Mchy. Co., Hartford
Keller Mech. Engr. Co., Brooklyn
Kempsmith Mfg. Co., Milwaukee
Lambert & Todd Mch. Co., Camden.
Lincoln Mach. Co., Pawtucket.
Long & Allstatter Co., Hamilton
Mehl Mach. T. & D. Co., Roselle
Meisel Press Mfg. Co., Boston.
Milholland Mach. Co., Indianapolis
Rowbottom Mach. Co., Waterbury.
Sexton Mach. Co., Hartford
Simplex Tool Co., Woonsocket.
Steel Products Eng. Co., Springfield, O.
Toledo Mch. & Tool Co., Toledo
Underwood Corp., H. B., Philadelphia
Waltham Mch. Wks., Waltham.
Warner & Swasey Co., Cleveland.
West Tool Co., Detroit

Controllers and Starters, Electric
General Electric Co., Schenectady

Converters
General Electric Co., Schenectady

Conveyors and Elevators (See Elevators)

Cotter Pins
Williams & Co., J. H., Brooklyn

Counterbores
National Twist D. & T. Co., Detroit
Pratt & Whitney Co., Hartford
Slocomb Co., J. T., Providence
West Tool Co., Detroit

Countershafts
Brown & Sharpe Mfg., Co., Providence
Evans Fric. Cone Co., Newton Highlands.
Garvin Mach. Co., N. Y.

Counters, Revolution
Bristol Co., Waterbury.

Countersinks
Greenfield Tap & Die Corp., Greenfield

Counting Machines
Hart Mfg. Co., R. A., Battle Creek

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Doehler Die Casting Co., Brooklyn.
Franklin Die Cast. Corp., Syracuse.

Coupling Hose, Universal
Chicago Pneu. Tool Co., N. Y.

Couplings, Flexible
Brown Engineering Co., Reading
Dexter Co., I. H., Goshen
Jones Fdry. & Mch. Co., W. A. Chicago
Smith & Serrell, Newark

Couplings, Rigid
Smith & Serrell, Newark.
Jones Fdry. & Mch. Co., W. A. Chicago

Couplings, Shaft
Almond Mfg. Co., T. R., Ashburnham
Dexter Co., I. H., Goshen
Johnson Mach. Co., Carlyle, Manchester.
Nicholson Co., W. H., Wilkes-Barre
Royersford Fdry. & Mch. Co., Royersford
Smith & Serrell, Newark.

Cranes, Electric (See Hoists and Cranes, Electric)

Cranes, Hand (See Hoists)

Cranes, Locomotive
Link-Belt Co., Chicago, Philadelphia

Cranes, Traveling
Canton Fdry. & Mch. Co., Canton.
Chisholm-Moore Mfg. Co., Cleveland
Harrington, Son & Co., Ed., Phila.
Link-Belt Co., Chicago, Philadelphia
Northern Eng. Wks., Detroit.
Pawling & Harnischfeger Co., Milwaukee
Toledo Crane Co., Bucyrus

Crank Pin Turning Machines
Underwood Corp., H. B., Phila.

Cut-Outs, Electrical
General Electric Co., Schenectady

Cutters, Gear
Brown & Sharpe Mfg., Co., Providence
National Twist D. & T. Co., Detroit
Union Twist Drill Co., Athol.

Cutters, Milling
Barber-Colman Co., Rockford
Brown & Sharpe Mfg. Co., Providence
Cowles Tool Co., Cleveland
Geometric Tool Co., New Haven
Gisholt Mach. Co., Madison
Haynes Stellite Co., Kokomo
Ingersoll Mill. Mch. Co., Rockford
Lovejoy Tool Co., Springfield, Vt.
Morse Twist Drill & Mch. Co., New Bedford.
National Twist D. & T. Co., Detroit
Pratt & Whitney Co., Hartford
Reed-Prentice Co., Worcester
Union Twist Drill Co., Athol.
West Tool Co., Detroit
Whitney Mfg. Co., Hartford.

Cutters, Thread
Rivett Lathe & Grinder Co., Boston.
Universal Mch. Co., Bowling Green

Cutting-Off Machines
Armstrong-Blum Mfg. Co., Chicago.
Armstrong Bros. Tool Co., Chicago.
Brown & Sharpe Mfg. Co., Providence
Earle Gear & Mach. Co., Phila.
Etna Mach. Co., Toledo
Garvin Mach. Co., N. Y.
Gorton Mach. Co., Geo., Racine.
Greenfield Tap & Die Corp., Greenfield
Newton Mch. T. Plant, Cons. Mch. T. Corp. of America, Phila.
Vandyck Churchill Co., N. Y.

Cutting-Off Machines, Pipe (See Pipe-Cutting and Threading Machines)

Cutting-Off Tools
Armstrong Bros. Tool Co., Chicago.
Pratt & Whitney Co., Hartford
Williams & Co., J. H., Brooklyn

Cutting Oil Filters (See Oil Filtering Systems)

Cutting, Oxy Acetylene
Milburn Co., Alex., Baltimore

Dealers, Machinery (See Searchlight Section)
Allen, Harry F., New York
Botwinik Bros., New Haven
Brownell Mch. Co., Providence
Consolidated Mch. T. Corp. of America, N. Y.
Froiland, Paul Springfield, Ill.
Garvin Mch. Co., N. Y.
Gelb & Co., J., N. Y.
Gisholt Mach. Co., Madison
Gordon & Freedman, N. Y.
Gould & Eberhardt, Newark
Harris Bros. Co., Chicago
Hill, Clarke & Co., Chicago.
Hyman & Sons, Jos., Philadelphia
Ideal Mchy. Co., Plainsville
Lamberg & Co., A., N. Y.
Lucas & Son, J. L., Bridgeport
McMullen Mchy. Co., Grand Rapids
Machinery Dealers, Inc., New Haven
Miles Mchy. Co., Saginaw
Morey & Co., N. Y.
Morris Mchy. Co., Newark
New Britain Mach. Co., New Britain
N. J. Mchy. Ex., Newark
Niles & Co., F. H., Jersey City
Niles-Bement-Pond, N. Y.
Osborne & Sexton Mchy. Co., Columbus
Prentiss & Co., Henry, N. Y.
Reed-Prentice Co., Worcester
Silber, Walter, Brooklyn
Simmons Mach. Co., Albany
Southwark Fdry. & Mch. Co., Phila.
Stokvis & Sons, R. S., N. Y.
Toomey, Frank, Philadelphia
Vandyck, Churchill Co., N. Y.
Wayne Mchy. Co., Fort Wayne.
Witbar Tool Co., N. Y.

Demagnetizers
Luma Elect. Equip. Co., Toledo

Diamond Tools
Crafts & Co., Arthur A., Boston.
Desmond-Stephan Mfg. Co., Urbana
Dickinson, Thomas L., N. Y.
Wheel Trueing Tool Co., Detroit

Die Making Machines
Anderson Die Cch. Co., Bridgeport
Keller Mech. Engr. Co., Brooklyn

Dies, Forging
Keller Mech. Engrav. Co., Brooklyn.

Dies, Self-opening Adjustable
Eastern Mch. Screw Corp., New Haven
Geometric Tool Co., New Haven
Jones & Lamson Mach. Co., Springfield, Vt.
Landis Mch. Co., Waynesboro
Murchey Mchy. & T. Co., Detroit
Victor Tool Co., Waynesboro

Dies, Sheet Metal and Sub-Press (See Tool Work)

Dies, Threading-Opening
Eastern Mch. Screw Corp., New Haven
Errington Mechanical Laboratory, N. Y.
Geometric Tool Co., New Haven
Greenfield Tap & Die Corp., Greenfield
Jones & Lamson Mach. Co., Springfield, Vt.
Landis Mch. Co., Waynesboro
Murchey Mchy. & T. Co., Detroit
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Victor Tool Co., Waynesboro
Warner & Swasey Co., Cleveland

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N. Y. Blue Print Paper Co., N. Y.

Drafting Materials
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Dressers, Grinding Wheel
Bay State Stamping Co., Worcester
Crafts & Co., Arthur A., Boston
Desmond-Stephan Mfg. Co., Urbana
Norton Co., Worcester

Drill Holders
Armstrong Bros. Tool Co., Chicago

Drill Speeders
Graham Mfg. Co., Providence
Turner Machine Co., Danbury

Drilling Attachments
Hjorth Lathe & Tool Co., Boston

Drilling Machine Heads
Baush Mch. T. Co., Springfield, Mass.
Hoefer Mfg. Co., Freeport.
Langelier Mfg. Co., Cranston
Nelson-Blanck Mfg. Co., Detroit.

Drilling Machines, Automatic
Baker Bros., Toledo
Baush Mch. T. Co., Springfield, Mass.
Langelier Mfg. Co., Cranston
Nat'l Automatic Tool Co., Richmond

Drilling Machines, Bench
Ames Co., B. C., Waltham
Barnes Co., W. F. & John, Rockford
Clark Jr. Elec., Co., Jas., Louisville
Hoefer Mfg. Co., Freeport
Langelier Mfg. Co., Cranston
Pratt & Whitney Co., Hartford
Sigourney Tool Co., Hartford
Silver Mfg. Co., Salem
Standard Elec. Tool Co., Cincinnati
Taylor & Fenn Co., Hartford.

Drilling Machines, Electric and Pneumatic
Black & Decker Mfg. Co., Baltimore
Chicago Pneumatic Tool Co., N. Y.
Clark Jr. Elec., Co., Jas., Louisville
Louisville Elec. Mfg. Co., Louisville
Neil & Smith Elec. T. Co., Cincinnati
Silver Mfg. Co., Salem
Standard Elec. T. Co., Cincinnati
U. S. Elec. Tool Co., Cincinnati

Drilling, Machines, Gang
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Barnes Drill Co., Rockford
Cincinnati (O.) Bickford Tool Co.
Foote-Burt Co., Cleveland
Fosdick Mch. Tool Co., Cincinnati
Langelier Mfg. Co., Cranston
Moline Tool Co., Moline
Rockford (Ill.) Drilling Mach. Co.
Silver Mfg. Co., Salem
Taylor & Fenn Co., Hartford

Drilling Machines, Heavy Duty
Baker Bros., Toledo
Betts Mch. Plant, Cons. Mch. T. Corp. of America, Rochester
Buffalo Forge Co., Buffalo
Foote-Burt Co., Cleveland
Fosdick Mch. Tool Co., Cincinnati
Hoefer Mfg. Co., Freeport
Minster Mch. Co., Minster
Ryerson & Son, Joseph T., Chicago

Drilling Machine & Horizontal (See Boring, Drilling and Milling Machines, Horizontal)

Drilling Machines, Multiple Spindle
Baker Bros., Toledo
Baush Mch. T. Co., Springfield, Mass.
Foote-Burt Co., Cleveland
Fox Mach. Co., Jackson, Mich.
Harrington, Son & Co., Ed., Phila.
Langelier Mfg. Co., Cranston
Nat'l Automatic Tool Co., Richmond
Newton Mch. T. Plant, Cons. Mch. T. Corp. of America, Phila.
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Sellers & Co., Wm., Philadelphia
Sigourney Tool Co., Hartford
Turner Machine Co., Danbury

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Harrington, Son & Co., Ed., Phila.
Morris Mch. Tool Co., Cincinnati
Muller Mch. Tool Co., Cincinnati
Newton Mch. T. Plant, Cons. Mch. T. Corp. of America, Phila.
Reed-Prentice Co., Worcester
Ryerson & Son, Joseph T., Chicago
Sellers & Co., Wm., Philadelphia

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Langelier Mfg. Co., Cranston
Muehlmatt, Adolph, Cincinnati
Reed-Prentice Co., Worcester
Royersford Fdry. & Mch. Co., Royersford
Sigourney Tool Co., Hartford
Taylor & Fenn Co., Hartford
Triplex Mch. Tool Corp., N. Y.

Drilling Machines, Turret
Nat'l Automatic Tool Co., Richmond
Turner Mch. Co., Danbury

Drilling Machines, Vertical
Baker Bros., Toledo
Barnes Drill Co., Rockford
Barnes Co., W. F. & John, Rockford
Baush Mch. T. Co., Springfield, Mass.
Betts Mch. Plant Cons. Mch. T. Corp. of America, Rochester
Cincinnati (O.) Bickford Tool Co.
Foote-Burt Co., Cleveland
Fosdick Mch. Tool Co., Cincinnati
Harrington, Son & Co., Ed., Phila.
Hoefer Mfg. Co., Freeport
Knight Mchy. Co., W. B., St. Louis
Langelier Mfg. Co., Cranston
Leland-Gifford Co., Worcester
Reed-Prentice Co., Worcester
Royersford Fdry. & Mach. Co., Royersford
Ryerson & Son, Jos. T., Chicago
Silver Mfg. Co., Salem
Taylor & Fenn Co., Hartford
Turner Mch. Co., Danbury

Drills, Center
Gledhill Mfg. Co., Providence
Morse Twist D. & M. Co., New Bedford
National Twist D & T. Co., Detroit
Pratt & Whitney Co., Hartford
Slocomb Co., J. T., Providence
Union Twist Drill Co., Athol

Drills, Ratchet
Armstrong Bros. Tool Co., Chicago
National Twist D. & T. Co., Detroit
Union Twist Drill Co., Athol

Drills, Twist and Flat
Buckeye Twist Drill Co., Alliance
Latrobe Tool Co., Latrobe
Morse Twist D. & M. Co., New Bedford
National Twist D. & T. Co., Detroit
Pratt & Whitney Co., Hartford
Union Twist Drill Co., Athol
West Tool Co., Detroit
Whitman & Barnes Mfg. Co., Akron

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General Electric Co., Schenectady
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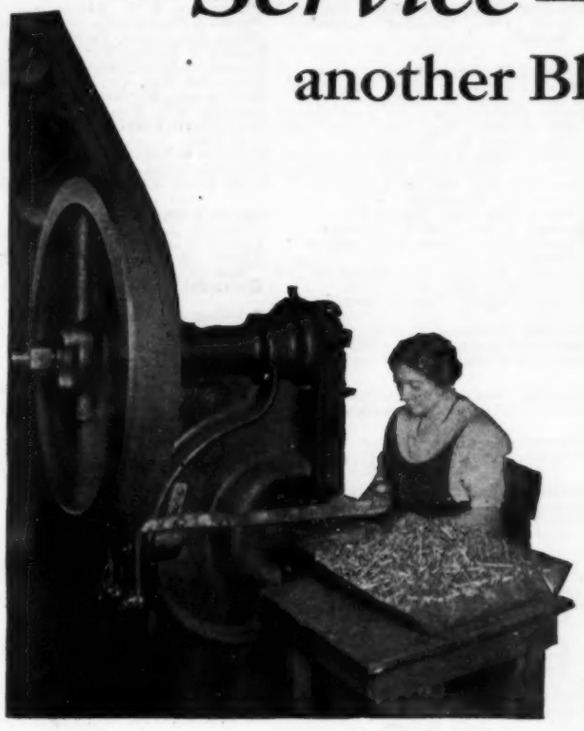

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Watson-Stillman Co., N. Y.

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Westinghouse Elect. & Mfg. Co., E. Pittsburgh

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General Electric Co., Schenectady
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Fans, Ventilating
General Electric Co., Schenectady
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

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Files
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Delta File Works, Philadelphia

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Cochrane-Bly Co., Rochester
Oliver Instrument Co., Adrian
Wardwell Mfg. Co., Cleveland

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Burroughs Co., Newark
Elmes Eng. Wks., Chas. F., Chicago
Watson-Stillman Co., N. Y.

Flexible Shafts
Errington Mechanical Laboratory, N. Y.
Strand & Co., N.A., Chicago

Forging Machinery
Acme Mchry. Co., Cleveland
Bradley & Son, C. C., Syracuse
National Mchy. Co., Tiffin

Forgings, Drop
Bearings Co. of America, Lancaster
Universal Mch. Co., Bowling Green
Williams & Co., J. H., Brooklyn

Foundry Equipment
Adams Co., Dubuque

Fuel Oil Burning System
Advance Furnace & Eng. Co., Springfield, Mass.
Chicago Flexible Shaft Co., Chicago

Furnaces, Forging
American Gas Furnace Co., Elizabeth
Chicago Flexible Shaft Co., Chicago

Furnaces, Heat-Treating, Coal
American Industrial Furnace Corp., Boston

Furnaces, Heat-Treating Oil and Gas
Advance Furnace & Eng. Co., Springfield, Mass.
American Gas Furnace Co., Elizabeth
American Industrial Furnace Corp., Boston
Brown & Sharpe Mfg. Co., Providence
Chicago Flexible Shaft Co., Chicago
Johnson Gas Appliance Co., Cedar Rapids

Furnaces, Tempering and Annealing
Advance Furnace & Eng. Co., Springfield, Mass.
American Gas Furnace Co., Elizabeth
Brown & Sharpe Mfg. Co., Providence
Chicago Flexible Shaft Co., Chicago
General Electric Co., Schenectady
Johnson Gas Appliance Co., Cedar Rapids

Furnaces & Ovens
General Electric Co., Schenectady
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

Furniture, Machine Shop
Brown Eng. Co., Reading
Manufacturing Equip. & Mfg. Co., Framingham

Gage Blocks
Bath & Co., John, Worcester
Pratt & Whitney Co., Hartford

Gages, Comparator
Jones & Lamson Mach. Co., Springfield, Vt.

Gages, Dial
Ames Co., B. C., Waltham
Brown & Sharpe Mfg. Co., Providence
Randall & Stickney, Waltham
Starrett Co., L. S., Athol

Gages, Micrometer Plug
Bath & Co., John, Worcester

Gages Micrometer Threaded Plug
Bath & Co., John, Worcester

Gages, Plug & Ring
Bath & Co., John, Worcester

Gages, Recording
Bristol Co., Waterbury

Gages, Snap, Thread and Cylindrical
Brown & Sharpe Mfg. Co., Providence
Greenfield Tap & Die Corp., Greenfield
Pratt & Whitney Co., Hartford

Gages, Standard
Brown & Sharpe Mfg. Co., Providence
Greenfield Tap & Die Corp., Greenfield
Hartford Special Mchy. Co., Hartford
Pratt & Whitney Co., Hartford

Gages, Thread
Bath & Co., John, Worcester

Gear Cutting Machines
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Barber-Colman Co., Rockford
Bilgram Mch. Wks., Philadelphia
Brown & Sharpe Mfg. Co., Providence
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Fellows Gear Shaper Co., Springfield, Vt.
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Garvin Mch. Co., N. Y.
Gleason Works, Rochester
Gould & Eberhardt, Newark
Harrington, Son & Co., Ed., Phila.
Newark Gear Cutting Mch. Co., Newark
Newton Mch. T. Plant, Cons. Mch. T. Corp. of America, Phila.
Reed-Prentice Co., Worcester
Waltham Mch. Wks., Waltham
Whiton Mch. Co., D. E., New London

Gear Tempering Machinery
Gleason Works, Rochester

Gear Testing Machinery
Adams Co., Dubuque
Brown & Sharpe Mfg. Co., Providence
Gisholt Mach. Co., Madison
Gleason Works, Rochester
Newark Gear Cut Mch. Co., Newark

Gear Tooth Rounders
Cross Gear & Eng. Co., Detroit

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Brown Co., A. & F., N. Y.
Brown & Sharpe Mfg. Co., Providence
Caldwell & Son Co., H. W., Chicago
Franklin Die Cast Corp., Syracuse
Grant Gear Works, Boston
Horsburgh & Scott Co., Cleveland
Jones Fdry. & Mch. Co., W. A., Chicago
Link-Belt Co., Chicago, Philadelphia
Philadelphia Gear Wks., Phila.

Gears, Cut
Adams Co., Dubuque
Albaugh-Dover Co., Chicago
Albro-Clem Elevator Co., Phila.
Baush Mch. T. Co., Springfield, Mass.
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Connecticut Gears, Inc., Waterbury
Diefendorf Gear Corp., Syracuse
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Flather & Co., Nashua
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Garvin Mch. Co., N. Y.
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Horsburgh & Scott Co., Cleveland
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Link-Belt Co., Chicago, Philadelphia
Massachusetts Gear & T. Co., Woburn
Meacham Gear Corp., Syracuse
Meisel Press Mfg. Co., Boston
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Niles-Bement-Pond Co., N. Y.
Philadelphia Gear Wks., Phila.
Simonds Mfg. Co., Pittsburgh

Gears, Forged
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Reliance Elect. & Eng. Co., Cleveland
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

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Royersford Fdry. & Mch. Co., Royersford
Sun Co., Philadelphia
White & Bagley Co., Worcester

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Dillon Elect. Co., Canton
Greenfield Tap & Die Corp., Greenfield
Louisville Elect. Mfg. Co., Louisville
Marschke Mfg. Co., Indianapolis
Norton Co., Worcester
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Louisville Elect. Mfg. Co., Louisville
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Stow Mfg. Co., Binghamton
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Cincinnati (O) Milling Mach. Co.
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Grinding Machines, Drill
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Blanchard Mach. Co., Cambridge
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Royersford Fdry. & Mch. Co., Royersford
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Bath & Co., John, Worcester

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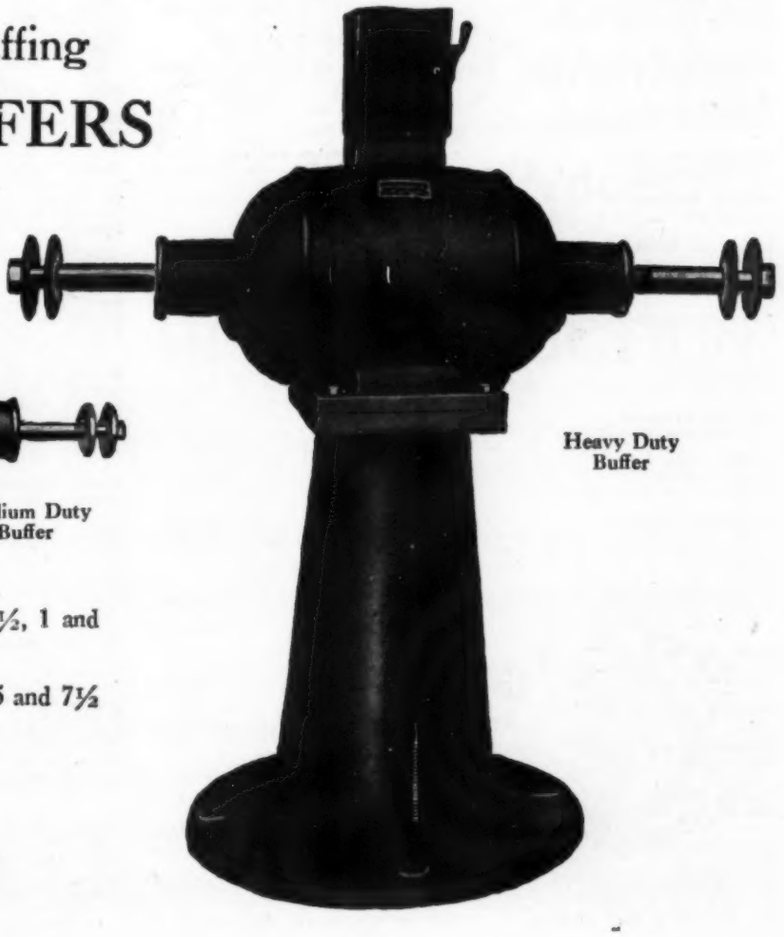

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Lathes, Chucking (See Lathes, Horizontal Turrett)

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Milling Machines Die
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Newton Mch. T. Plant, Cons. Mch. T. Corp. of America, Phila.
Underwood Corp., H. B., Phila.

Milling Machines, Thread
Foster Mch. Co., Elkhart.
Gisholt Mach. Co., Madison
Hall Planetary Thread Milling Mch. Co., Philadelphia
Harrington Son & Co., Ed., Phila.
Newton Mch. T. Plant, Cons. Mch. T. Corp. of America, Phila.
Pratt & Whitney Co., Hartford
Waltham Mch. Works, Waltham.

Milling Machines, Universal
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O) Milling Mach. Co.
Fox Machine Co., Jackson, Mich.
Garvin Mch. Co., N. Y.
Ingersoll Mill Mch. Co., Rockford
Kearney & Trecker Co., Milwaukee.
Kempsmith Mfg. Co., Milwaukee
LeBlond Mch. Tool Co., R. K., Cincinnati.
Potter & Johnston Mch. Co., Pawtucket.
Reed-Prentice Co., Worcester
Ryerson & Son, Joseph T., Chicago
Van Norman Mch. T. Co., Springfield, Mass.

Milling Machines, Vertical
Betts Mch. Plant Cons. Mch. T. Corp. of America, Rochester
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O) Milling Mach. Co.
Garvin Machine Co., N. Y.
Ingersoll Mill. Mch. Co., Rockford
Kearney & Trecker Co., Milwaukee.
Knight Mchy. Co., W. B., St. Louis
LeBlond Mch. Tool Co., R. K., Cincinnati.
Newton Mch. T. Plant, Cons. Mch. T. Corp. of America, Phila.
Potter & Johnston Mch. Co., Pawtucket.
Reed-Prentice Co., Worcester
Triplex Mch. Tool Corp., N. Y.
Van Norman Mch. T. Co., Springfield, Mass.

Milling Machines, Worm
Cleveland (O.) Auto. Mch. Co
Newton Mch. T. Plant, Cons. Mch. T. Corp. of America, Phila.
Waltham Mch. Works, Waltham.

Milling Tools, Adjustable Hollow
Geometric Tool Co., New Haven

Motors, Electric
Burke Electric Co., Erie
Reliance Elect. & Eng Co., Cleveland
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Nickel Sheets
Strand & Co., N. A., Chicago

Nut Tappers (See Bolt and Nut Machinery)

Nuts, Lock (See Lock-Nuts)

Oil and Grease Cups
Bay State Stamp Co., Worcester.
Bowen Products Corp., Auburn
Gits Bros. Mfg. Co., Chicago.
Tucker, W. A. & C. F., Hartford.

Oil Stones
Norton Co., Worcester

Oils
Sun Co., Philadelphia
White & Bagley Co., Worcester.

Oxygen
Linde Air Products Co., N. Y.

Packing, Hydraulic
Schieren Co., Chas. A., N. Y.

Pattern Shop Machinery (See Woodwork Machinery)

Patterns, Wood and Metal
Mehl Mch. T. & D. Co., Roselle.

STEVENSON PROCESS

The Last Word in Gear Cutting

BLOWER TIMING GEARS

Cut by

Stevenson

for

ROOTS

Limits of Accuracy on the ROOTS GEAR

Concentricity	.001 in.
Exact Size of P. D	.002 in.
Tooth Thickness	.0005 in.
Tooth Spacing	.0005 in.
Backflash	.001 in.

Accuracy—Quietness

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With

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Stevenson Gear Company
Indianapolis, Indiana

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Pipe Bending Machines
Harrington Son & Co., Ed., Phila.
Underwood Corp., H. B., Phila.

Pipe Cutting & Threading Machines
Bignall & Keeler Mch. Wks., Edwardsville.
Fox Mch. Co., Jackson, Mich.
Greenfield Tap & Die Corp., Greenfield
Harrington, Son & Co., Ed., Phila.
Landis Mch. Co., Waynesboro.
Murchey Mch. & T. Co., Detroit
Saunders Sons, D., Yonkers.
Williams Tool Corp., Erie

Pipe Fitters' Tools
Butterfield & Co., Derby Line.
Ryerson & Son, Jos. T., Chicago
Williams & Co., J. H., Brooklyn.

Piston Ring Machines
Potter & Johnston Mch. Co., Pawtucket

Planer Tools
Haynes Stellite Co., Kokomo

Planing Machines
American Tool Wks Co., Cincinnati
Betts Mch. Plant Cons. Mch. T. Corp. of America, Rochester
Cincinnati Planer Co., Cincinnati.
Gray Co., G. A., Cincinnati.
Hamilton Mch. T. Co., Hamilton
Liberty Mch. T. Co., Hamilton
Newton Mch. T. Plant, Cons. Mch. T. Corp. of America, Phila.
Reed-Prentice Co., Worcester
Ryerson & Son, Joseph T., Chicago
Sellers & Co., Wm., Philadelphia.

Planing Machines, Rotary
Newton Mch. T. Plant, Cons. Mch. T. Corp. of America, Phila.
Underwood Corp., H. B., Phila.

Pneumatic Tools
Anderson Bros. Mfg. Co., Rockford
Chicago Pneu. Tool Co., N. Y.

Polishing and Buffing Machines
Barnes Co., W. F. & John, Rockford
Blanchard Mch. Co., Cambridge.
Blount Co., J. G., Everett.
Brown & Sharpe Mfg. Co., Providence
Bryant Chuck Grind Co., Springfield Vt.
Gardner Mch. Co., Beloit
Greenfield Tap & Die Corp., Greenfield
Heald Mch. Co., Worcester.
Landis Tool Co., Waynesboro.
Newton Mch. T. Plant, Cons. Mch. T. Corp. of America, Phila.
Rivett Lathe & Grinder Co., Boston
Rowbottom Mach. Co., Waterbury.
Royersford Fdry. & Mch. Co., Royersford
Safety Emery Wheel Co., Springfield, O.
Union Twist Drill Co., Athol.
Van Norman Mch. Tool Co., Springfield, Mass.

Presses, Arbor
Barnes Co., W. F. & John, Rockford
Nicholson & Co., W. H., Wilkes-Barre

Presses, Drop and Forging
Ams Mch. Co., Max, N. Y.
Bliss Co., E. W., Brooklyn.
Elmes Eng. Wks., Chas. F., Chicago
Toledo Mch. & Tool Co., Toledo.

Presses, Foot and Hand
Bliss Co., E. W., Brooklyn.
Ferracute Mach. Co., Bridgeton.
Shuster Co., F. B., New Haven
Taylor & Fenn Co., Hartford.

Presses, Forcing
Ams Mch. Co., Max, N. Y.
Barnes Co., W. F. & John, Rockford
Lucas Mch Tool Co., Cleveland.

Presses, Hydraulic
Burroughs Co., Newark
Elmes Eng. Wks., Chas. F., Chicago
U. S. Tool Co., Newark
Watson-Stillman Co., N. Y.

Presses, Power
Ams Mch. Co., Max, N. Y.
Barnes Co., W. F. & John, Rockford
Bliss Co., E. W., Brooklyn
Ferracute Mach. Co., Bridgeton
Loy & Nawrath Division Birmingham Iron Fdry., Derby
Rowbottom Mch. Co., Waterbury.
Stoll Co., D. H., Buffalo.
Toledo Mch. & Tool Co., Toledo.
U. S. Tool Co., Newark
V & O Press Co. Glendale, L. I.

Presses, Screw
Barnes Co., W. F. & John, Rockford
Bliss Co., E. W., Brooklyn.

Profiling Machines
Becker Milling Mch. Co., Worcester
Garvin Machine Co., N. Y.
Pratt & Whitney Co., Hartford
Stark Tool Co., Waltham
Wade-American Tool Co., Waltham

Pulley Turning and Boring Machines
American Tool Wks. Co., Cincinnati.

Pulleys, Cork Insert
American Pulley Co., Philadelphia.

Pulleys, Metal
American Pulley Co., Philadelphia.
Brown Co., A. & F., N. Y.
Brown & Sharpe Mfg. Co., Providence
Caldwell & Son Co, H. W., Chicago.
Johnson Mach. Co., Carlyle, Manchester.

Pumps, Hydraulic
Burroughs Co., Newark
Elmes Eng. Wks., Chas. F., Chicago

Pumps, Lubricant and Oil
Brown & Sharpe Mfg. Co., Providence

Pumps, Power
Sullivan Mchy. Co., Chicago

Punches, Center
Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S., Athol.

Punches, Hand
Armstrong-Blum Mfg. Co., Chicago.

Punches, Power
Buffalo Forge Co., Buffalo
Ferracute Mach. Co., Bridgeton.
Mitts & Merrill, Saginaw
Royersford Fdry. & Mch. Co., Royersford
Ryerson & Son, Joseph T., Chicago
Watson-Stillman Co., N. Y.

Pyrometers, Electric
Bristol Co., Waterbury.

Rack Cutting Machines
Newark Gear Cut Mch. Co., Newark

Rack, Machine
Standard Gauge Steel Co., Beaver Falls

Racks, Cut
Meisel Press Mfg. Co., Boston
Moltrup Steel Products Co. Beaver Falls

Racks, Storage (See Furniture, Machine Shop)

Rammers, Foundry
Brown & Sharpe Mfg. Co., Providence
Chicago Pneu. Tool Co., N. Y.

Rawhide, Rope
Schieren Co., Chas. A., N. Y.

Reamer Holders
Gisholt Mach. Co., Madison
Victor Tool Co., Waynesboro

Reamers, Adjustable
Davis Boring Tool Co., St. Louis
Hannifin Mfg. Co., Chicago

Reamers, Expanding
Brubaker & Bros. Co., W. L., N. Y.
Davis Boring Tool Co., St. Louis
Gisholt Mach. Co Madison
Greenfield Tap & Die Corp., Greenfield

Reamers, Solid
Brubaker & Bros. Co., W. L., N. Y.
Buckeye Twist Drill Co., Alliance
Butterfield & Co, Derby Line.
Gammon-Holman Co., Manchester
Greenfield Tap & Die Corp., Greenfield
Morse Twist D. & M. Co., New Bedford.
National Twist D. & T. Co., Detroit
Reed Mfg. Co., Erie.
Union Twist Drill Co., Athol.
Whitman & Barnes Mfg. Co., Akron

Reamers, Taper
Brown & Sharpe Mfg. Co., Providence
Gammon-Holman Co., Manchester
Greenfield Tap & Die Corp., Greenfield
Union Twist Drill Co., Athol

Recorders, Pressure
Bristol Co., Waterbury.

Recorders, Temperature
Bristol Co., Waterbury.

Recorders, Time
Gisholt Mach. Co., Madison

Rheostats
General Electric Co., Schenectady
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

Rivet Heating
American Gas Furnace Co., Elizabeth

Rivet Sets
Chicago Pneu. Tool Co., N. Y.
Hunter Saw & Machine Co., Pittsburgh

Rivet Making Machinery
Cook Co., Asa S., Hartford.
National Machinery Co., Tiffin.
Ryerson & Son, Jos. T., Chicago

Riveting Machines
Chicago Pneu. Tool Co., N. Y.
Grant Mfg. & Mch. Co., Bridgeport
Independent Pneu. T. Co., Chicago
Shuster Co., F. B., New Haven.
Townsend Mfg. Co., H. P., Hartford

Rod Cutters
Tucker, W. A. & C. F., Hartford.

Rules, Steel and Wood
Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S., Athol.

Rust Preventives
Oakley Chemical Co., N. Y.

Sand Rammers, Pneumatic
Chicago Pneu. Tool Co., N. Y.

Saw Frames and Blades, Hack
American Saw & Mfg. Co., Springfield, Mass.
Diamond Saw & Stamp. Wks., Buffalo.
Napier Saw Wks., Springfield, Mass.
Starrett Co., L. S., Athol.

Saw Sharpening Machines
Greenfield Tap & Die Corp., Greenfield
Hunter Saw & Mch. Co., Pittsburgh
Wardwell Mfg. Co., Cleveland

Saw Tables, Universal
Silver Mfg. Co., Salem

Sawing Machines, Metal
Armstrong-Blum Mfg. Co., Chicago
Diamond Saw & Stamp. Wks., Buffalo.
Earle Gear & Mach. Co., Phila.
Greenfield Tap & Die Corp., Greenfield
Newton Mch. T. Plant, Cons. Mch. T. Corp. of America, Phila.
Peerless Mach. Co., Racine
Vandyck Churchill Co., N. Y.

Sawing Machines, Power Hack
Armstrong-Blum Mfg. Co., Chicago
Diamond Saw & Stamp. Wks., Buffalo.
Peerless Mach. Co., Racine

Saws, Metal Cutting
American Saw & Mfg. Co., Springfield, Mass.
Barber-Colman Co., Rockford
Brown & Sharpe Mfg. Co., Providence
Hunter Saw & Mach. Co., Pittsburgh
Pratt & Whitney Co., Hartford
Silver Mfg. Co., Salem
Union Twist Drill Co., Athol.

Saws, Milling
Barber-Colman Co., Rockford
Brown & Sharpe Mfg. Co., Providence
Union Twist Drill Co., Athol

Saws, Screw Slotting
Barber-Colman Co., Rockford
Brown & Sharpe Mfg. Co., Providence
Pratt & Whitney Co., Hartford
Starrett Co., L. S., Athol, Mass.
Union Twist Drill Co., Athol.

Scales
Brown & Sharpe Mfg. Co., Providence

Scraping Outfits
Hergi Mfg. Co., Bridgeport

Screw Driving Outfits
Hergi Mfg. Co., Bridgeport

Screw-Machine Work
Cincinnati (O.) Automatic Mch. Co.
Eastern Mch. Screw Corp., New Haven
Link-Belt Co., Chicago, Philadelphia
Morris Mch. Tool Co., Cincinnati.
National Blank Book Co., Holyoke
Simplex Tool Co., Woonsocket
Taft-Peirce Mfg. Co., Woonsocket.

Screw Machy., Wood and Lag
Cook Co., Asa S., Hartford.
Townsend Mfg. Co., H. P., Hartford

Screw Machines, Automatic
Brown & Sharpe Mfg. Co., Providence
Cincinnati (O.) Automatic Mch. Co.
Cleveland (O.) Automatic Mach. Co.
Cone Auto. Mch. Co., Windsor

Screw Machines, Plain or Hand
Acme Mch. Tool Co., Cincinnati.
Brown & Sharpe Mfg. Co., Providence
Cleveland (O) Auto Mach. Co.
Foster Mach. Co., Elkhart.
Garvin Mach. Co., N. Y.
Greenfield Tap & Die Corp., Greenfield
Jones & Lamson Mch. Co., Springfield, Vt
Millholland Mch. Co., Indianapolis
Warner & Swasey Co., Cleveland.

Screw Plates
Brubaker & Bros. Co., W. L., N. Y.
Butterfield & Co., Derby Line.
Card Mfg. Co., S. W. Mansfield.
Greenfield Tap & Die Corp., Greenfield
Morse Twist D. & M. Co., New Bedford.

Screws, Cap and Set
Allen Mfg. Co., Hartford.
Bristol Co., Waterbury.
National Acme Co., Cleveland.

Screws, Machine
Allen Mfg. Co., Hartford.
Bristol Co., Waterbury.

Seamless Steel Tubing (See Tubing, Seamless Steel)

Second-Hand Machinery (See Searchlight Section)
Allen, Harry F., New York
Botwinik Bros., New Haven
Brownell Mchy. Co., Providence
Cincinnati Planer Co., Cincinnati.
Consolidated Mch. T. Corp. of America, N. Y.
Essley Mchy. Co., E. L., Chicago
Emmerman, Louis E., Chicago
Froiland, Paul Springfield, Ill.
Garvin Machine Co., N. Y.
Gelb & Co., J., N. Y.
Gisholt Mach. Co., Madison
Gordon & Freedman, N. Y.
Gould & Eberhardt, Newark
Harris Bros. Co., Chicago
Hill, Clarke & Co., Chicago.
Hyman & Sons, Jos., Philadelphia
Ideal Mchy. Co., Plainsville
Lamberg & Co., A., N. Y.
Lucas & Son, J. L., Bridgeport
McMullen Mchy. Co., Grand Rapids
Machinery Dealers, Inc., New Haven
Miles Mchy. Co., Saginaw
Morey & Co., N. Y.
Morris Mchy. Co., Newark
New Britain Mach. Co., New Britain
N. J. Mchy. Ex., Newark
Niles & Co., F. H., Jersey City
Niles-Bement-Pond, N. Y.
Osborne & Sexton Mchy. Co., Columbus
Prentiss & Co., Henry, N. Y.
Reed-Prentice Co., Worcester
Silber, Walter, Brooklyn
Simmons Mch. Co., Albany
Southwark Fdry. & Mch. Co., Phila.
Stokvis & Son, R. S., N. Y.
Toomey, Frank, Philadelphia
Vandyck, Churchill Co., N. Y. City
Warner & Swasey Co., Cleveland
Wayne Mchy. Co., Fort Wayne.

Separators, Oil and Waste
Oil & Waste Saving Mch. Co., Phila.

Shafting
Royersford Fdry. & Mch. Co., Royersford
Strand & Co., N. A., Chicago.
Union Drawn S. Co., Beaver Falls

Shapes, Cold-Drawn Special Steel
Standard Gauge Steel Co., Beaver Falls
Moltrup Steel Products Co. Beaver Falls
Union Drawn S. Co., Beaver Falls.

Shaping Machines
American Tool Wks. Co., Cincinnati
Cincinnati Shaper Co., Cincinnati
Gould & Eberhardt, Newark
Kelly Co., R. A., Xenia, O.
Morton Mfg. Co., Muskegon Hgts.
Newton Mch. T. Plant, Cons. Mch. T. Corp. of America, Phila.
Ohio Mach. T. Co, Co., Kenton
Potter & Johnston Mch. Co., Pawtucket.
Ryerson & Son, Joseph T., Chicago
Smith & Mills Co., Cincinnati.
Springfield (O.) Mach. Tool Co.

Shear Blades
Cleveland (O.) Twist Drill Co.

Shears, Hand
Armstrong-Blum Mfg. Co., Chicago.
Tucker, W. A. & C. F., Hartford.

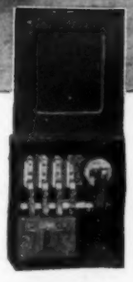
Shears, Power
Buffalo Forge Co., Buffalo
Ferracute Mach. Co., Bridgeton.
Mitts & Merrill, Saginaw
Royersford Fdry. & Mch. Co., Royersford
Stoll Co., D. H., Buffalo.
Toledo Mch. & Tool Co., Toledo.

Sheet Metal Working Machinery
Ams Mch. Co., Max, N. Y.
Bliss Co., E. W., Brooklyn
Ferracute Mach. Co., Bridgeton.
Ryerson & Son, Jos. T., Chicago
Savage Co., W. J., Knoxville.
Toledo Mch. & Tool Co., Toledo.

Slide Rests
Milliken Mch. Co., West Newton

Magnetic Starting Switches—for controlling small alternating-current motors thrown directly on the line

Push Button Stations, for actuating G-E Magnetic Switches, may be placed on the machine for convenience in starting and stopping—they are invaluable in emergencies.



G-E CR 7006-D2 Enclosed Magnetic Switch with two-coil hand-reset Temperature Overload Relay. Maximum ratings—10 H. P., 110 and 220 volts; 5 H. P., 440 and 550 volts. 3 and 4 pole.

G-E CR 7006-D3 with Temperature Overload Relay. Maximum ratings—10 H.P., 110 volts; 25 H.P., 220 volts; 35 H.P., 440 and 550 volts. Has magnetic blow-outs. 3 pole only.

G-E CR 7005-A2. Suitable for A.C motors up to 3 H.P., 110 volts; and 5 H.P., 220, 440, or 550 volts. 3 pole only. Equipped with Inverse Time Protective Plugs which are economical and convenient for the protection of motors not frequently overloaded.

Motor control at a touch

This line of G-E Magnetic Starting Switches is the result of leadership constantly maintained in building switches that improve motor operation.

Features of these switches are capacity for service and life of contacts—durable, sheet steel enclosing case—convenience of installation—ease of inspection and renewal of vital parts—compact and pleasing appearance—undervoltage and overload protection.

For protection against overloads these Magnetic Switches are equipped with Inverse Time Protective Plugs—and Temperature Relays which is the latest and most improved design in the field.

Protective Plugs heat practically the same as motors when overloaded, and so protect the motor from dangerous overloads. Temperature Relays afford protection similar to that of the Protective Plugs, but they also provide additional protection according to the increased or decreased horsepower capacity of the motor due to low or high atmospheric temperatures.

Thousands of G-E Magnetic Switches are in successful operation—meeting severe service in many installations.

General Electric Company

General Office Schenectady, N.Y.

Sales Offices in all large cities

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Slotting Machines
Betts Mch. Plant Cons. Mch. T. T. Corp. of America, Phila.
Newton Mch. T. Plant, Cons. Mch. T. Corp. of America, Phila.
Garvin Mach. Co., N. Y.
Sellers & Co., Wm., Philadelphia

Sockets and Sleeves
Philadelphia Gear Wks., Phila.
Pratt & Whitney Co., Hartford

Soldering Equipment
Luma Elect. Equip. Co., **Toledo**

Special Machinery and Tools
(See Contract Work)
Cleveland (O.) Twist Drill Co.

Speed Reducers
Jones Fdry. & Mch. Co., W. A. Chicago

Spindles
Ex-Cell-O T. & Mfg. Co., Detroit

Spring Winders
Wjorth Lathe & Tool Co., Boston

Sprockets and Chains
Baldwin Chain & Mfg. Co., Worcester
Bilgram Mch. Wks., Philadelphia.
Boston Gear Wks., Norfolk Downs.
Cullman Wheel Co., Chicago.
Diamond Chain & Mfg. Co., Indianapolis
Grant Gear Wks., Boston.
Jones Fdry. & Mch. Co., W. A. Chicago
Link-Belt Co., Chicago, Philadelphia
Massachusetts Gear & T. Co., Woburn
Morse Chain Co., Ithaca.
Philadelphia Gear Wks., Phila.
Whitney Mfg. Co., Hartford.

Squares
Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S., Athol.

Stampings, Metal
American Pulley Co., Philadelphia.
Bay State Stamp. Co., Worcester.
Detroit Stamp. Co., Detroit.
Globe Mch. & Stamp Co., Cleveland
National Blank Book Co., Holyoke
Rockwood Sprinkler Co., Worcester

Stamps, Steel
Hoggson & Peters Mfg. Co., New Haven
Noble & Westbrook Mfg. Co., Hartford.
Pannier Bros Steam Co., Pittsburgh
Schwerdtle Stamp Co., Bridgeport

Stands, Portable (See Furniture, Machine Shop)

Steam Specialties
Dart Mfg. Co., E. M., Providence.

Steel, Cold Rolled Strip
Hawkridge Bros. Co., Boston.

Steel Hardness Measuring Instruments
Shore Instrument & Mfg. Co., N. Y.

Steel, Shafting and Free Cutting Screw
Hawkridge Bros. Co., Boston.
Moltrup Steel Products Co., Beaver Falls
Standard Gauge Steel Co., Beaver Falls
Union Drawn S. Co., Beaver Falls.

Steel, Sheet
Hawkridge Bros. Co., Boston.
Jessop & Sons, William, N. Y.
Moltrup Steel Products Co., Beaver Falls

Steels, Alloy, Carbon, and High Speed
Armstrong Bros. Tool Co., Chicago.
Firth-Sterling Steel Co., McKeesport
Hawkridge Bros. Co., Boston.
Haynes Stellite Co., Kokomo
Jessop & Sons, Wm., N. Y.
Jones & Co., B. W., N. Y.
Vanadium Alloys Steel Co., Pittsburgh
Vulcan Crucible Steel Co., Aliquippa

Straightening Machinery
Haynes Stellite Co., Kokomo
Shuster Co., F. B., New Haven.
Springfield (O.) Mach. Tool Co.
Standard Eng. Wks., Pawtucket.

Stud Setters Self-Opening
Errington Mechanical Laboratory N. Y.
Geometric Tool Co., New Haven

Subpresses and Dies
Waltham Mach. Wks., **Waltham.**

Surface Plates
Simplex Tool Co., **Woonsocket.**

Swaging Machines
Etna Mach. Co., Toledo
Langelier Mfg. Co., **Cranston**
Torrington Co., Torrington.

Switches and Switchboards
General Electric Co., Schenectady
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

Tachometers
Bristol Co., **Waterbury.**

Tap Extensions
Allen Mfg. Co., **Hartford.**

Tap Holders
Errington Mechanical Laboratory, N. Y.
Gisholt Mach. Co., Madison
Greenfield Tap & Die Corp., Greenfield

Taps, Ground
Bath & Co., John, Worcester

Taper Pins
Brown & Sharpe Mfg. Co., Providence
Pratt & Whitney Co., Hartford

Tapes, Measuring
Starrett Co., L. S., Athol.

Tapping Machines and Attachments
Acme Mchy. Co., Cleveland.
American Tool Wks. Co., Cincinnati
Anderson Die Mch. Co., Bridgeport
Baker Bros., Toledo
Barber-Colman Co., Rockford
Beaman & Smith Co., Providence.
Cincinnati (O.) Bickford Tool Co.
Errington Mechanical Laboratory N. Y.
Fox Mch. Co., Jackson, Mich.
Garvin Mach. Co., N. Y.
Geometric Tool Co., New Haven
Harrington, Son & Co., Ed., Phila.
Hoefer Mfg. Co., Freeport, Ill.
Langelier Mfg. Co., Cranston
Moline Tool Co., Moline.
Murchey Mch. & T. Co., Detroit
Nat'l Automatic T. Co., Richmond
National Mchy. Co., Tiffin.
Taylor Instrument Cos., Rochester
Turner Machine Co., Danbury.

Taps and Dies
American Tap & Die Co., Greenfield
Brubaker & Bros. Co., W. L., N. Y.
Butterfield & Co., Derby Line.
Card Mfg. Co., S. W., Mansfield.
Greenfield Tap & Die Corp., Greenfield
Morse Twist D. & M. Co., New Bedford
Murchey Mch. & T. Co., Detroit
Pratt & Whitney Co., Hartford

Taps, Collapsing
Eastern Mch. Screw Corp., New Haven
Errington Mechanical Laboratory N. Y.
Geometric Tool Co., New Haven
Murchey Mch. & T. Co., Detroit
Victor Tool Co., Waynesboro.

Thermometers
Bristol Co., **Waterbury.**

Thread-Cutting Tools
Eastern Mch. Screw Corp., New Haven
Geometric Tool Co., New Haven
Greenfield Tap & Die Corp., Greenfield
Jones & Lamson Mch. Co., Springfield, Vt.
Landis Mach. Co., Waynesboro.
Murchey Mch. & T. Co., Detroit
Pratt & Whitney Co., Hartford
Rivett Lathe & Grinder Co., **Boston**
Victor Tool Co., Waynesboro

Thread Rolling Machines
Murchey Mch. & T. Co., Detroit
National Machinery Co., **Tiffin.**

Threading Machines
Eastern Mch. Screw Corp., New Haven
Geometric Tool Co., New Haven
Greenfield Tap & Die Corp., Greenfield
Hall Planetary Thread Milling Mch. Co., Philadelphia.
Landis Mach. Co., Waynesboro.
Murchey Mch. & T. Co., Detroit
National Machy. Co., Tiffin.
Universal Mch. Co., Bowling Green

Tool Holders
Armstrong Bros. Tool Co., Chicago.
Gisholt Mach. Co., Madison
Lovejoy Tool Co., Springfield, Vt.
Pratt & Whitney Co., Hartford
Williams & Co., J. H., Brooklyn.

Tool Marking, Electric
Luma Elect. Equip. Co., Toledo

Tool Posts, Lathe
Armstrong Bros. Tool Co., Chicago.
Williams & Co., J. H., Brooklyn

Tool Work (See Contract Work)

Tools, Small (See Machinists' Small Tools)

Tractors, Industrial
Elwell Parker Elect. Co., Cleveland

Transformers
Foote Bros. Gear & Mch. Co., Chicago
General Electric Co., Schenectady
Westinghouse Elect. & Mfg. Co., E. Pittsburgh

Transmission Machinery
Baldwin Chain & Mfg. Co., Worcester
Foote Bros. Gear & Mch. Co., Chicago
Jones Fdry. & Mch. Co., W. A. Chicago
Moore & White Co., Philadelphia
Morse Chain Co., Ithaca
Royersford Fdry. & Mch. Co., Royersford

Transportation System (See Trucks)

Trolleys and Tramways
Chisholm-Moore Mfg. Co., Cleveland
Harrington, Son & Co., Ed., Phila.

Trucks
Lakewood Eng. Co., Cleveland

Trucks, Industrial
Elwell Parker Elect. Co., Cleveland
Lakewood Eng. Co., Cleveland

Tubing, Flexible
Almond Mfg. Co., T. R., Ashburnham

Turret Heads
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